OCTOBER, 1951

METAL FINISHING

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FOUNDED 1903

E. C. S. MEETING • BARREL FINISHING
CYANIDE D.E.T. IN WASTE • METAL SHOW
NEW PROCESS FOR MAGNESIUM
Complete contents Page 47

Read & Pass On

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Low Micro-Inch Surface Economically Produced

with SPEE-D-BURR PROCESS*

In an Oblique or Horizontal Tumbling Barrel

Detailed operating procedures are outlined on pages 12 and 13 of the Clepo Barrel Finishing Manual and on page 17 of the 1951 Clepo Cleaning Catalogue. A request on your company letterhead will bring this information to you.

Our local Clepo Service Representative will also call to explain fully all details.

* Patent Pending.

CLEPO CLEANING COMPOUNDS

FREDERICK GUMM Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

OCTOBER, 1951 VOLUME 49 • NUMBER 10

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COMING SOON

Control of bright zinc solutions without using the Total Cyanide-Zinc ratio.

Using radio-active barium reagent for rapid sulfate determination in chrome solutions.

A discussion of the various materials used in polishing and buffing compositions, and their properties.

Methods for the chemical analysis of multi-component alkaline cleaners.

Published Monthly by
FINISHING PUBLICATIONS, INC.
founded 1903 as
Metal Industry Publishing Co., Inc.
11 West 42nd St. New York 18, N. Y.
Telephone: PEnnsylvania 6-0226

Pacific Coast Office
Los Angeles 13
424 S. Broadway
MAdison 6-5421

also publishers of
Organic Finishing, monthly

Member

CCA — Controlled Circulation Audit

NBP — National Business Publications

Society of Business Magazine Editors

SUBSCRIPTION PRICES: United States, $4.00 and Canada $4.00 per year. Other countries $8.00. Single copies 45c in U. S. and Canada, Foreign 85c. Guidebook-Directory issue, published separately, 488 pages, 5¼ x 7⅞, 1950 revised, 19th annual edition, $2.50. Please remit by check or money order; cash should be registered.

Contributed articles, communications, etc., on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement.

The WASHINGTON OBSERVER

George W. Grupp

News and Views from The Nation's Capitol

• The plating industry will have difficulty in obtaining fans and blowers after January 1st because the NPA has curtailed the allotment of raw materials to manufacturers of these items. A spokesman for the industry stated that "the Government fails to recognize the essentiality of fans and blowers to defense-producing industries."

• New restrictions were placed on the use of nickel for electroplating by Schedule 1 of NPA Order M-80.

• A Senate subcommittee is investigating the nickel black market, which has already involved the electroplating industry.

• The NPA issued Direction 4 to NPA Order M-11 which provides that producers of copper controlled materials may not fill any orders after October 1, 1951 other than as authorized by controlled material orders.

• The United States Government released 25,000 tons of copper from its stockpile to ease the tight situation created by the recent strike.

• The manufacture of synthetic detergents, commonly called "soapless" soaps, will be curtailed because of the shortage of sulfuric acid.

• The steel shipping container industry has asked the NPA to amend Order M-75 to permit 60-day inventories for new as well as used steel drums.

• The Navy Department's Bureau of Docks have found that cathodic protection of tanks extends their life from five to ten years. This safeguard against galvanic and electrolytic deterioration is maintained artificially by providing DC power at strategic points.

• The consumption of tin during the first quarter of 1951 was 13.5% higher than the corresponding period in 1950, according to the NPA.

• Some firms are reporting an increase in absenteeism because some of their workers are holding down two jobs in an effort to increase their earnings.

Saving Nickel

Lea Copper-Glo

Something New in Bright High Speed Copper Plating

The Ronal Bright Copper Process* using Lea Copper-Glo is the answer to the platers' prayers because it answers the problem of extreme nickel shortages.

Lea Copper-Glo makes it practicable to plate properly prefinished steel and die-castings *directly* with chromium without any intermediate buffing operation. It makes it possible for you to forget your nickel worries.

The user of Lea Copper-Glo enjoys numerous advantages as for example:

OPERATING

- **Brilliant ductile deposits**
- **High current density with 100% efficiency**
- **Exceptional throwing power**
- **No wetting agents required**
- **Direct, interrupted or periodic reverse current**

COST SAVINGS

- **Reduces tank plating time due to high speed operation. (Hull cell bright current density range 10-60 amp./ft.²)**
- **Reduces rejects whether followed by bright nickel or otherwise; since it contains no wetting agents**
- **Reduces brightener costs to a few cents/100 gallons of plating solution per day**

The Ronal Bright Copper Process using Lea Copper-Glo can be fitted into your plant operating cycle. Regular cyanide or Rochelle Copper baths can be readily converted to obtain these advantages. Write for further information.

**Ronal Bright Copper Process is a development of Ronal Chemicals, Brooklyn, New York, for which process patents are pending.*

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

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ESTABLISHED 1303

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

VOLUME 48 • NUMBER 10 • OCTOBER 1951

Black Nickel

In recent weeks the plating industry has undoubtedly obtained more publicity than ever before in its history. However, the odor created by it all is not exactly comparable to Chanel 5.

The recent inquiry by the Senate's Select Committee on Small Business into the black market which exists in certain plating materials, principally nickel, has shown with convincing clarity how a small group of ruthless, unscrupulous chiselers can effectively victimize industry and thus endanger our national security.

We hope that those found guilty of violating the law will get the "book thrown at them" for their deeds, as well as providing a much-needed deterrant to others tempted by the lure of easy profit. Unfortunately, however, there will be a number of these shady characters who will escape their just deserts because there are too many loopholes in the present regulations governing transactions in these scarce materials. As a matter of fact, careful evaluation of the testimony brought out in the recent hearings reveals a surprising number of convenient loopholes in the regulations themselves as well as in the distribution system.

We sincerely hope that the splendid efforts of Senator Moody's committee in exposing this vicious racket will not go the way of the usual Senate investigations, and that prompt and effective measures will be taken to stamp out the operations of these traiterous leeches. A more direct and effective system of allocations for nickel and other scarce materials, especially to small users, certainly seems to be an immediate necessity.

The one bright spot in this whole odoriferous situation is provided by the courageous and patriotic action of a few men in the plating industry who helped to expose the whole mess, rather than go along dealing with the racketeers. The plating industry owes them at least a rising vote of thanks.

W. A. Raymond

Editor

100th Meeting of The Electrochemical Society

Detroit — October 10-11-12

THE 33rd annual National Metal Congress and Exposition will be held this year at the Motor City, Detroit, Michigan, on October 13-19. This annual meeting and exhibit is sponsored by the American Society for Metals in co-operation with several other technical societies in the metal working field. The theme of the meeting will be "Production for Defense."

Technical sessions for the A.S.M. will be held in the Statler Hotel, in downtown Detroit, while the Exposition will be housed in the Michigan State Fair Grounds on Eight Mile Road.

World Metallurgical Congress

One of the special features of this year's meeting will be the holding of the First World Metallurgical Congress, with headquarters at the Hotel Tuller.

More than 500 "conferees" from upwards of 20 freedom loving countries will assemble for an "exchange of ideas" and join with thousands of American metallurgists who will participate. Metal resources, upon which rest the security and freedom of the world, will be thoroughly discussed by these top-ranking metal scientists and engineers from the free nations of Europe, Africa and Asia, as well as from North and South America.

In announcing the World Metallurgical Congress, A.S.M. President *Walter Jominy* pointed out that the full support of the Economic Cooperation Administration of Washington, D. C. had been extended.

The foreign visitors, known as "conferees," will spend approximately five weeks in the United States. During the first four weeks they will be divided into eight groups participating in a series of study tours to industrial, government and educational institutions to observe at first hand the scientific, industrial and educational advances that have taken place in this country during the past few years. Some 150 plants in 13 states and 57 cities are to be visited.

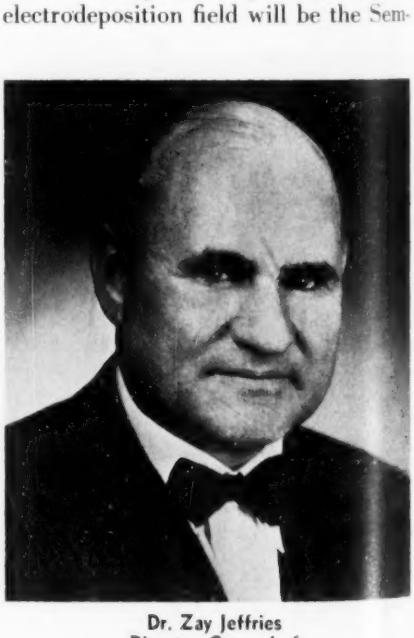
Dr. Zay Jeffries, affectionately known as the "dean of American Metallurgists," has been appointed Director-General of the World Metallurgical Congress. Dr. Jeffries is a world-renowned metallurgist, and a past president of the A.S.M.

The World Metallurgical Congress is expected to further international understandings, and will provide broad opportunities for the interchange of ideas among scientists that will bear on more efficient production for defense that ultimately means freedom and peace. In Detroit, visiting conferees will each have an "opposite number"—an American whose technical, scientific or business interest closely parallels his own. They will meet in special session to exchange ideas and present scientific papers dealing with metals.

Session on Metal Interfaces

One of the technical sessions that will be of special importance to the electrodeposition field will be the Sem-

Walter E. Jominy
Chrysler Corp., Detroit
President, American Society for Metals



Dr. Zay Jeffries
Director-General of
World Metallurgical Congress

One of the exhibit buildings at the Michigan State Fair Grounds, where the Metal Show displays will hold forth.

inar on Metal Interfaces, at which a number of papers will be presented describing the mechanism and reactions that occur during grain growth, interfacial energies, atomistic theory of metallic surfaces, etc. This Seminar will be held on Saturday and Sunday, Oct. 13-14.

Metal Show

The exhibit portion of the National Metal Congress will take place at the Michigan State Fair Grounds. Some special meetings and forums will also be held here.

Approximately 350 firms in the metal working field are expected to exhibit their latest equipment and techniques. The following firms will exhibit metal finishing equipment and techniques:

Acme Mfg. Co.
1430 E. 9 Mile Rd., Detroit, Mich.
Automatic polishing and buffing machines.

Alvey Ferguson Co.
625 Disney St., Cincinnati 9, O.
Washing and cleaning machines.

American Wheelabrator & Equip. Co.
505 S. Byrkit St., Mishawaka, Ind.
Blast cleaning equipment.

F. E. Anderson Oil Co.
Brownstone Ave., Portland, Conn.
Rust preventatives.

G. S. Blakeslee & Co.
1844 52 Ave., Chicago, Ill.
Vapor degreasing machinery.

Bruce Products Corp.
6519 Grand River, Detroit, Mich.
Polishing and buffing compositions.

Cro-Plate Co.
747 Windsor Ave., Hartford 5, Conn.
Wet blast equipment and chrome plating units.

Detrex Corp.
14331 Woodrow Wilson Ave., Detroit, Mich.
Vapor degreasing equipment.

Diversey Corp.
1800 W. Roscoe, Chicago, Ill.
Cleaners, chemicals for metal working.

E. I. Du Pont de Nemours Co.
Wilmington, Del.
Electroplating Chemicals

Electric Products Co.
1737 Clarkstone Rd., Cleveland, O.
Motor generators, rectifiers.

Hammond Machinery Builders
1600 Douglas Ave., Kalamazoo, Mich.
Automatic polishing and buffing machines.

Harshaw Chemical Co.
1945 E. 97 St., Cleveland, O.
Nickel plating process and chemicals.

Higbie Mfg. Co.
Rochester, Mich.
Polishing and buffing compositions.

E. F. Houghton
303 W. Lehigh St., Phila., Pa.
Rust preventatives, blackening salts.

S. C. Johnson & Son
1525 Howe St., Racine, Wisc.
Metal protective waxes.

Kalamazoo Tank & Silo Co.
508 Harrison St., Kalamazoo, Mich.
Wood tanks for pickling, etc.

Kelite Products, Inc.
1250 N. Main St., Los Angeles, Calif.
Metal cleaners and chemicals.

Kold-Hold Mfg. Co.
Lansing 4, Mich.
Platecoils for heating tanks.

Kolene Co.
7310 Woodward Ave., Detroit, Mich.
Process for descaling metals.

Manufacturers Processing Co.
1704 E. 9 Mile Rd., Detroit, Mich.
Vapor degreasing equipment.

Multifinish Mfg. Co.
2116 Monroe Ave., Detroit, Mich.
Barrel finishing equipment; tank magnets.

National Lead Co.
111 Broadway, N. Y., N. Y.
Lead anodes and acid proof handling equipment.

Oakite Products, Inc.
22 Thames St., N. Y., N. Y.
Metal cleaners and chemicals.

Osborn Mfg. Co.
5401 Hamilton Ave., Cleveland, O.
Industrial brushes and wheels.

Park Chemical Co.
Military & VanCouver Aves., Detroit, Mich.
Polishing wheel cement.

Parker Rust Proof Co.
2177 E. Milwaukee Ave., Detroit, Mich.
Phosphate processes for metal preservation.

Phillips Mfg. Co.
3496 W. Touhy Ave., Chicago, Ill.
Vapor degreasing machines.

Production Machine Co.
Greenfield, Mass.
Polishing and grinding machines.

Solventol Chemical Products Inc.
15481 Second Blvd., Detroit, Mich.
Cleaners and chemicals.

Sparkler Mfg. Co.
Mundelein, Ill.
Filtering equipment.

H. O. Trerice Co.
1420 Lafayette, Detroit, Mich.
Temperature control equipment.

Udylite Corp.
1651 E. Grand Blvd., Detroit, Mich.
Plating and finishing equipment and supplies.

United Chromium Corp.
100 E. 42 St., N. Y., N. Y.
High speed chrome plating; treatments for zinc and cadmium; lacquers and corrosion-resistant coatings.

National Metal Congress and Exposition

Detroit — October 13-19

THE annual Fall meeting of the Electrochemical Society, the 100th meeting of this organization, will be held at the Hotel Statler, Detroit, Michigan on October 10-11-12, with a full program of technical and social sessions planned. All technical sessions will be held at the headquarters hotel, and several plant visits have been arranged to nearby chemical and manufacturing plants.

All six major Divisions of the Society will have programs under way during the three day meeting, but the programs of the Corrosion Division and the Electrodeposition Division will be of special interest to electroplaters and metal finishing engineers. Due to the importance of these operations in and around the Detroit area, it is expected that a large turnout will be on hand.

A special series of events have been planned to entertain the ladies who accompany their menfolk to this affair.

Technical sessions in the Corrosion Division and the Electrodeposition Division will be held on all three days. Presiding over the technical sessions in the Electrodeposition Division will be *Dr. R. A. Woofter*, chairman of the Division, and *Dr. M. L. Holt*, vice-chairman. *Dr. C. A. Snavely* is the Division Secretary. The Corrosion technical sessions will be presided over by *Dr. Norman Hackerman*.

On Thursday afternoon the first Palladium Medal Award Lecture will be given by *Dr. Carl Wagner*, of the Mass. Inst. of Technology. Another special feature will be the Memorial Luncheon to the late *Dr. Carl E. Heussner* on Thursday.

General Program

WEDNESDAY, OCTOBER 10

REGISTRATION IN THE BALLROOM FOYER
8:30 a.m. - 9:00 p.m.

REGISTRATION FEE
Members $7.00 Non-members $9.00
Students $2.00 Ladies $3.00

9:00 a.m.

Formal Opening. Welcome by General Chairman and response by Pres. *R. M. Hunter*.

9:15 a.m.

TECHNICAL SESSIONS OF THE CORROSION DIVISION

Tech. Chairman—*Dr. Norman Hackerman*

"The Nature of Zinc Corrosion Products" by *P. T. Gilbert*, British Non-Ferrous Metals Research Ass'n., London, England.

"Dissolution of Magnesium in Hydrochloric Acid" by *B. Roald*, Norwegian Defense Research Establishment, Norway, and *W. Beck*, American Electro Metals Corp., Yonkers, N. Y.

"Influence of Oxygen on the Corrosion of Aluminum in Electrolytic Solutions" by *W. Beck, R. G. Gold* and *F. Keihn*, Lehigh University, Bethlehem, Pa.

"Corrosion of Aluminum by Carbon Tetrachloride" by *M. Stern* and *H. H. Uhlig*, Mass. Inst. of Tech., Cambridge, Mass.

"Effect of Oxide Films on the Reaction of Aluminum with Carbon Tetrachloride" by *M. Stern* and *H. H. Uhlig*, M.I.T., Cambridge, Mass.

"Resistance of Titanium to H_2SO_4 and HCl Inhibited with Ferric and Cupric Ions" by *J. R. Cobb* and *H. H. Uhlig*, M.I.T., Cambridge, Mass.

"Crystal Structure and Corrodibility of Steels in Inhibited HCl," by *P. H. Cardwell*, Dowell Inc., Tulsa, Okla.

12:30 p.m.

Corrosion Division Luncheon.

1:30 p.m.

Tour through the Chrysler Corp. Engineering and Research Laboratories.

2:00 p.m.

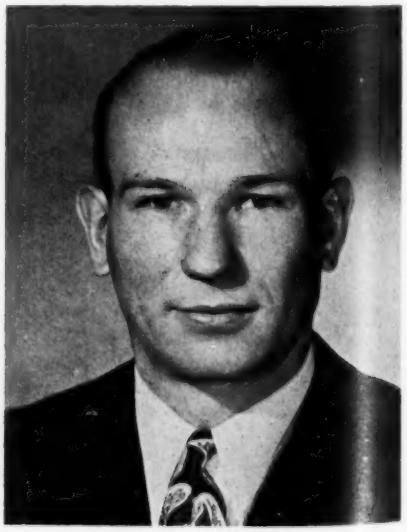
TECHNICAL SESSION OF THE CORROSION DIVISION

"Correlation Between the Parabolic Oxidation Rates of Metals and Properties of Their Oxides" by *A. Dravnieks*, Eng. Research Dept., Standard Oil Co., Chicago, Ill.

"Structure and Kinetics of Formation of Anodic Coatings on Zirconium" by *R. D. Misch* and *A. H. Roebuck*, Argonne National Laboratory, Chicago, Ill.

Dr. R. A. Woofter

Dr. M. L. Holt



Dr. C. A. Snavely

"Spectrometric Study of the Oxidation of Tantalum" by *J. T. Waber* & *G. E. Sturdy*, Los Alamos; *E. M. Wise*, Int. Nickel Co., and *C. R. Tipton*, Battelle Inst.

"Crystal Orientation in the Oxidation of Iron" by *E. A. Gulbransen* & *R. Ruka*, Westinghouse Research Labs., Pittsburgh, Pa.

"Electron Diffraction Studies on the Oxidation of Pure Copper and Zinc" by *E. A. Gulbransen* and *W. R. McMillan*, Westinghouse Research Labs., Pittsburgh, Pa.

6:30 p.m.

Cocktails and Dinner. Entertainment and Dancing. Charge $7.00 per person.

THURSDAY, OCTOBER 11

8:30 a.m.

Plant tour through the Ford Motor Co. Waste Disposal Plant at Monroe, Mich.

9:00 a.m.

CORROSION DIVISION TECHNICAL SESSIONS

"Passivation of Metals" by *R. Speiser, F. H. Beck, M. G. Fontana, E. N. Lassettre*, Ohio State Univ., Columbus, O.

"Passivity of Iron Films in Nitric Acid" by *H. C. Gatos* and *H. H. Uhlig*, M.I.T., Cambridge, Mass.

"Surface Reactions of Steel in Dilute Chromate Solutions" by *R. A. Powers* and *N. Hackerman*, Univ. of Texas, Austin, Tex.

"Rotogeneration Detection of Corrosion Currents" by *J. B. McAndrew, W. H. Collner*, and *H. T. Francis*, Armour Institute, Chicago, Ill.

"Thermogalvanic Potentials of Nickel in Neutral Nickel Sulfate Solutions" by *D. S. Carr*, International Nickel Co., and *C. F. Bonilla*, Columbia Univ., N. Y. C.

"Mathematical Studies of Galvanic Corrosion" by *J. T. Waber*, Los Alamos Scientific Lab., Los Alamos, N. Mex.

"Effects of Alkaline Detergents on a Magnesium Die Casting Alloy" by *J. F. Hazel*, Univ. of Penn., and *W. Stericker*, Phila. Quartz Co., Phila., Pa.

12:00 noon

Carl E. Heussner Memorial Luncheon. *Paul Ackerman* will be the speaker.

2:00 p.m.

TECHNICAL SESSIONS OF THE ELECTRODEPOSITION DIVISION AND THE CORROSION DIVISION

Corrosion Papers

"Mechanism of Dissolution of Titanium in Hydrofluoric Acid" by *M. E. Straumanis* and *P. C. Chen*, Univ. of Missouri, Rolla, Mo.

"Electrokinetics of the Dissolution of Metals in Acids" by *M. E. Straumanis* and *P. C. Chen*.

"Polaragraphic Study of Temperature on Oxidation Rates of Iron, Zinc, Lead" by *P. Delahay, C. F. Pillon, D. Perry*, La. State Univ., Baton Rouge, La.

"Rate of Corrosion of Silver in Ferric Perchlorate" by *C. V. King* and *F. S. Lang*, N. Y. U., N. Y. C.

Electrodeposition Papers

"Plating Silver on Nickel Steels for Glass-to-Metal Seals" by *R. T. Foley, R. D. Alvord*, and *J. K. Easley*, General Electric Co., Pittsfield, Mass.

Statler Hotel, Detroit, headquarters for this year's meeting.

"Plating Zinc from Alkaline Pyrophosphate Baths" by *J. E. Stareck*, United Chromium, Inc., Detroit, Mich.

"Plating Aluminum from Non-Aqueous Solutions" by *D. E. Couch* and *A. Brenner*, National Bureau of Standards, Washington, D. C.

"Current Distribution over a Cylinder with Hemispherical Ends" by *S. Barnarrt*, Westinghouse Research Labs., Pittsburgh, Pa.

4:00 p.m.

Palladium Medal Address by *Dr. Carl Wagner*.

6:30 p.m.

Reception for *Dr. Carl Wagner*, followed by Annual Award Dinner. Music. Tickets for this affair are $6.00 per person.

FRIDAY, OCTOBER 12

8:00 a.m.

Plant trip to the *Dow Chemical Co.*, Midland. This trip will take the entire day, and a charge of $3.00 per person will be levied to cover transportation. Lunch will be furnished by the *Dow Chemical Co.*

9:00 a.m.

SECOND TECHNICAL SESSION OF THE ELECTRODEPOSITION DIVISION

"Tungsten Alloy Plating" by *W. E. Clark*, and *M. E. Lietzke*.

"Tin-Zinc Plating in the U. S." by *F. A. Lowenheim*, Metal & Thermit Corp., Rahway, N. J.

"Plating Rhenium-Cobalt and Rhenium-Iron Alloys" by *L. E. Netherton* and *M. L. Holt*.

"Co-Deposition of Tin-Nickel from Chloride-Fluoride Baths" by *J. W. Cuthbertson* and *N. Parkinson*, Tin Research Inst., London, Eng.

"Plating Cobalt-Tungsten-Molybdenum Alloys from Citrate Baths" by *R. F. McElwee* and *M. L. Holt*.

12:30 p.m.

Luncheon and Business Meeting of the Electrodeposition Division.

2:00 p.m.

THIRD TECHNICAL SESSION OF THE ELECTRODEPOSITION DIVISION

"Effect of Temperature on the Cathode During Nickel Plating" by *D. R. Turner*, Westinghouse Elec. Co., Pittsburgh, Pa.

"Effect of Chloride Ions on Copper Plating" by *W. H. Gauvin* and *C. A. Winkler*, McGill Univ., Montreal, Canada.

"Effect of Sulfates of Certain Tripositive Cations on Chrome Plating" by *E. S. Snavely* and *N. Hackerman*, Univ. of Texas, Austin, Tex.

"Electrolytic Determination of Tin and Tin-Iron Alloy Coating Weights on Tin Plate" by *C. T. Kunze* and *A. R. Willey*, American Can Co., Maywood, Ill.

"Structure of Tin-Nickel Alloy Deposits" by *H. P. Rooksby*, Wembley, England.

"Stress Reduction in Plated Nickel" by *V. J. Marchesse*, Sperry Gyroscope Co., Great Neck, N. Y.

A New Finish for Magnesium Alloys

By Harry A. Evangelides, *Chem. Eng., Army Ordnance Corps, Frankford Arsenal, Phila., Pa.*

The author is a graduate of Brooklyn Polytechnic Institute. After graduation he worked under Dr. C. L. Mantell in the manufacture of colloid mills, and later in the asphalt industry and in the field of sanitary engineering. For the last ten years has served as Chemical Engineer for the Army Ordnance Corps.

IN the past decade, magnesium has assumed tremendous importance in many industrial fields, and especially in the field of aircraft construction. The most notable characteristic of magnesium is its lightness, and reduction in weight is a factor of greatest importance in the aircraft industry. The use of magnesium in aircraft and airborn equipment saves many pounds, allowing additional gallons of fuel for longer flying range or increased load-carrying capacity.

Although the potential importance and utility of magnesium is well-known to engineers, many were reluctant to use it for lack of a suitable protective finish. Poor corrosion, abrasion and heat resistance have been the main factors that have retarded the use of magnesium alloys in many applications.

A suitable protective coating for magnesium alloy surfaces must have the following characteristics:

a. protect the metal from attack by salt water, or other corrosive environments.
b. protect the surface from wear and abrasion.
c. have good heat insulating properties.
d. possess high electrical insulating properties to protect the metal from galvanic corrosion.

Numerous treatments for the protection of magnesium alloy surfaces have been described in the literature. The most widely known and used treatments are the acid dichromate and the galvanic anodize.

The acid dichromate treatment consists of a 5 minute immersion in an aqueous solution of hydrofluoric acid followed by rinsing in cold water and boiling in a dichromate solution.

The galvanic anodized treatment is also a two step procedure. A 5 minute immersion in an aqueous solution of hydrofluoric acid is followed by treatment in a solution containing ammonium sulfate and sodium dichromate at a pH 4.2 to 5.5. The cathode consists of steel plates, but if the tank is made of steel it provides the cathode.

The above treatments form a uniform, smooth coating, provide a satisfactory paint base, and with a suitable paint system they give to magnesium alloys a fair degree of protection from salt water corrosion. Both the dichromate and galvanic anodize coatings are soft and have no insulating properties, and therefore offer no protection from wear, abrasion, thermal shock or galvanic corrosion.

The HAE Process Coating

The HAE coating recently developed in the *Pitman-*

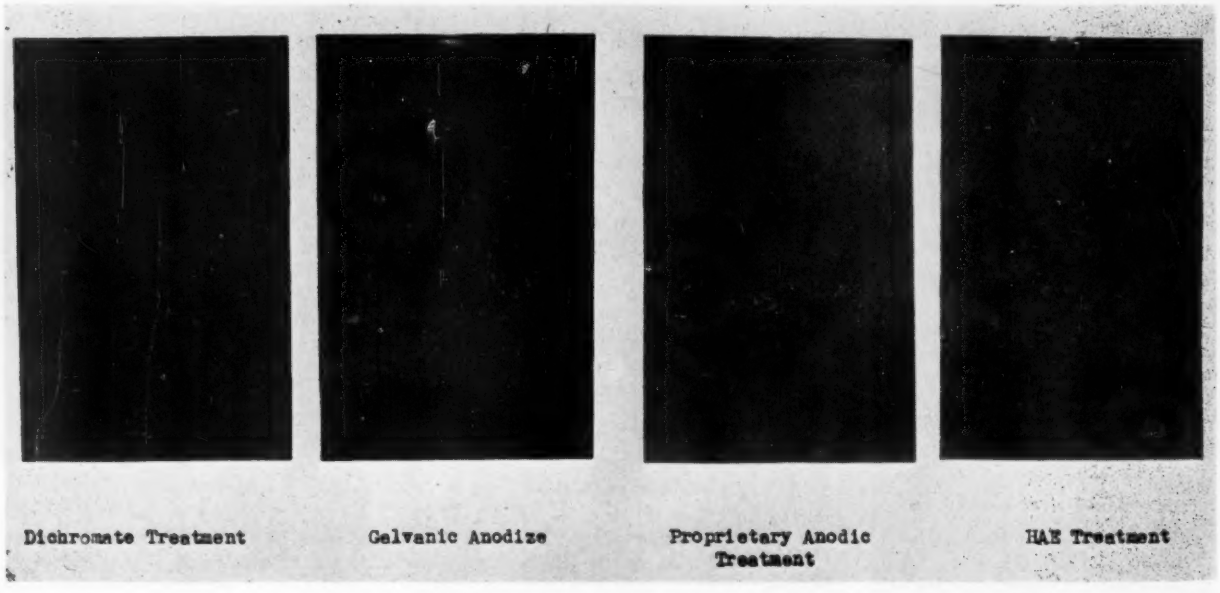


Figure 1. Panels subjected to a temperature of 1100°F. and quenching in water. Cracking is evident on all but the HAE processed panels.

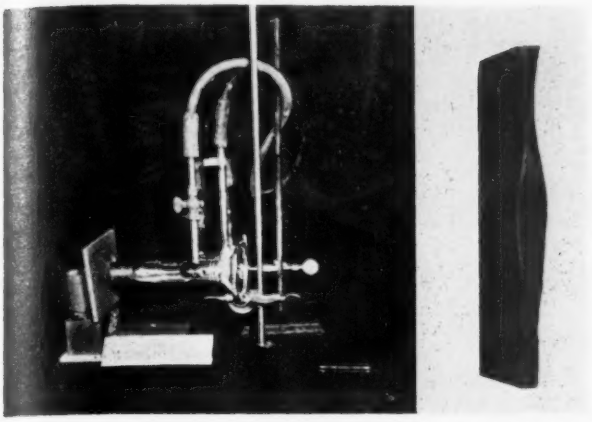


Figure 2. Set-up for checking the heat resistance of the coating. At right the bulged panel, with coating film unbroken, is shown.

Dunn Laboratories at Frankford Arsenal is an electrolytic process and can be applied to all magnesium alloys including the rare-earth magnesium alloys. The new process produces a refractory ceramic coating which has excellent corrosion, abrasion and heat resistance. The bath has good throwing power and provides a coating which is an excellent paint base. It is a finish which has so far proven its superiority under various operating conditions over all other treatments.

Hardness

The coating will scratch glass. It is estimated that the hardness on the Mohs scale is between 7 and 8. It can be used to polish RC65 steel.

Thickness

The thickness of the coating will vary from .001" to .0015", depending on the length of treatment. The overall increase in thickness is approximately 80% of the thickness of the coating.

Surface Quality

The texture of the HAE coating is such that it furnishes an excellent base for wax or paint. A wax dip or a paint system, such as zinc chromate primer and baking enamel over HAE treated magnesium surfaces, will give thousands of hours protection from salt spray corrosion. A waxed HAE treated magnesium panel is being continuously exposed to salt spray. To date it has accumulated 8000 hours without a sign of corrosion. Absolute protection of 800 to 1000 hours has been obtained from HAE treated panels dipped in a 15% wax solution in toluene.

Thermal Shock, Resistance and Adhesion

To illustrate the high resistance of the HAE coating to thermal shock a 4" x 6" x .038" thick HAE treated

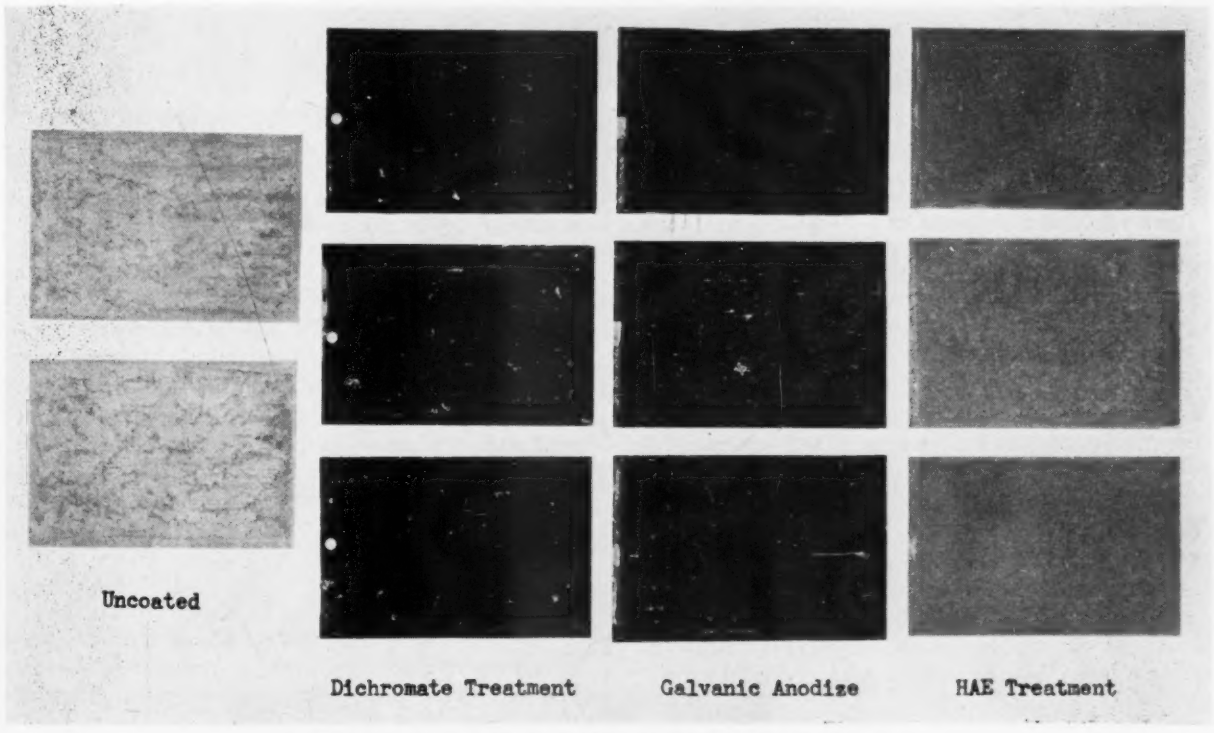


Figure 3. Comparative test coatings after a 165 hour salt spray test.

Color

The color of the HAE coating is brown of variable shades. A dip in a 35-50% by volume of 52% hydrofluoric acid for 20-30 seconds imparts a lighter shade to the coating and at the same time renders it more resistant to corrosion. The acid dip also overcomes the danger of residual alkali on the surface, thus insuring a good paint base.

panel was subjected to a temperature of 1100°F. in an electric muffle furnace for 30 seconds, then withdrawn and dropped quickly into cold water. The magnesium panel buckled slightly, but did not crack nor produce any visible impairment of the coating. Three other panels of equal dimensions, one having the dichromate treatment, the other the galvanic anodize and the third a proprietary anodic treatment, were subjected to the

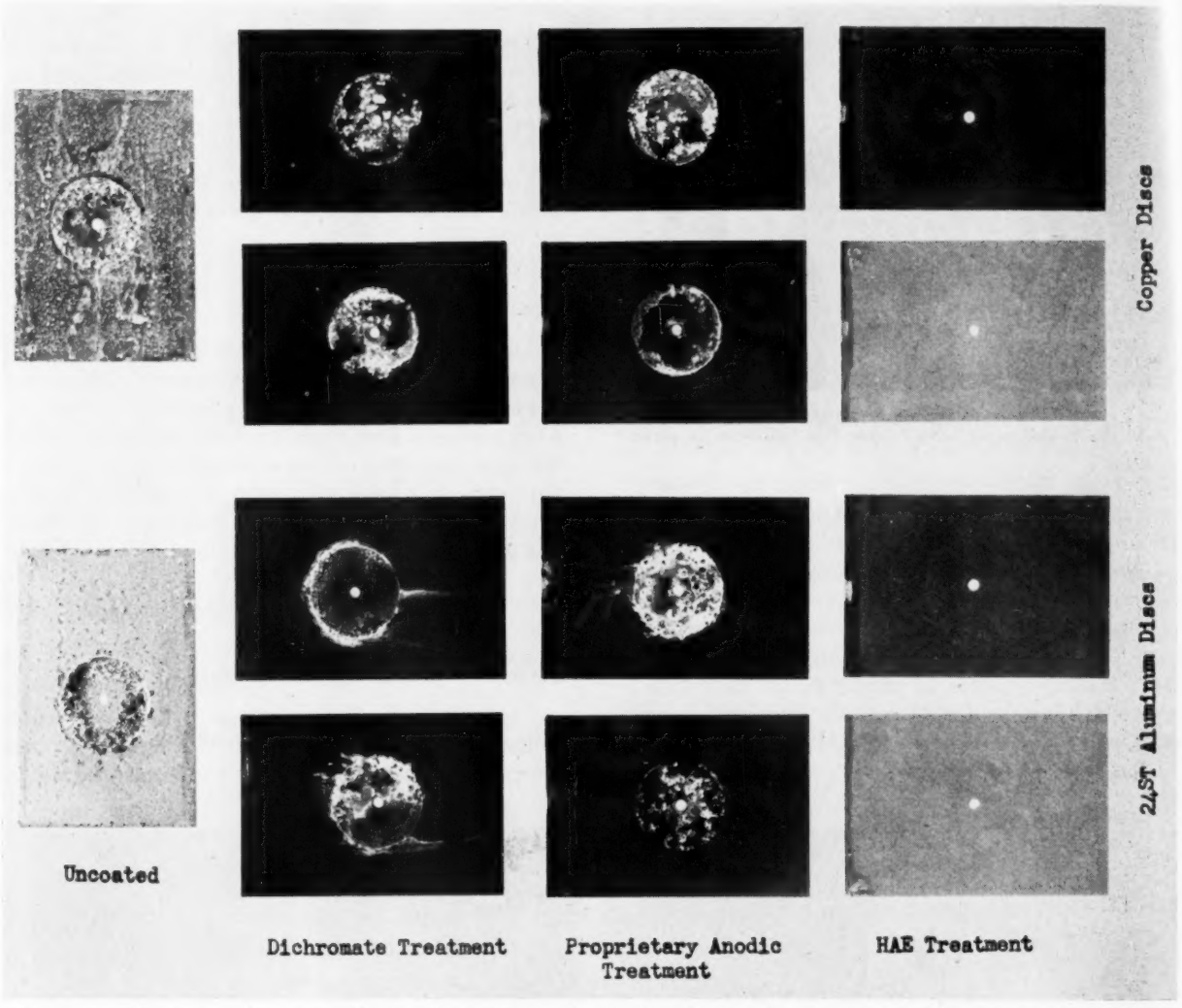


Figure 4. Galvanic corrosion test specimens after a 5 hour salt spray test. See text for a description of the test assembly method.

same test. Figure I shows the results of the test. The dichromate and the galvanic anodized panels broke in several places. They are held together with Scotch tape on the underside. The panels having the proprietary anodic treatment cracked in 3 places, as shown.

The above test illustrates also the excellent adhesion of the HAE coating to the magnesium surface.

Heat Resistance

The heat resistance of the HAE coating is much greater than that of the magnesium metal itself. A 4" x 6" x ¼" panel was held vertically and subjected to the flame of two Fisher blast burners (see Figure II). The magnesium melted locally and flowed downward forming a bulge, but the coating remained unimpaired.

Throwing Power

The non-conductive nature of the HAE coating enables this new process to coat recessed areas and enclosures with little or no difficulty. The tendency is for the current to flow to the bare metal more readily than to the coated surface.

Salt Spray Corrosion

One of the outstanding characteristics of the HAE coating is its resistance to salt corrosion. HAE-treated magnesium alloy (JI) panels without any organic supplemental treatment normally recommended for corrosion resistance showed no corrosion after a 90-hour exposure to salt spray. Figure III shows treated magnesium alloy panels after 165-hour exposure to salt spray. The galvanic anodize and dichromate treated panels have an average of more than 80 corrosion pits each, while the HAE panels have an average of only 4 very small pits each. More than one-half of the surface of the two uncoated panels is covered with corrosion.

A similar test using another magnesium alloy (FS-1) showed comparable results, after a 96 hour salt spray test period.

Galvanic Corrosion

When two dissimilar metals are brought in contact in a corrosive medium such as salt water, the metal whose position in the electromotive series is higher will corrode at a faster rate. Magnesium in contact with aluminum, stainless steel or copper will therefore corrode at a faster rate than the aluminum, copper or stainless steel. This may be prevented if the magnesium surface is protected with a coating of high dielectric strength. A .001" thickness of HAE coating will resist an electrical potential of 550 volts at 60 cycles.

Figure 4 shows an assembly of treated magnesium alloy FS-1 panels with 24ST aluminum and copper discs after a 5 hr. salt spray exposure. Two-inch diameter discs with a ¼" hole in the center were used. The side of the disc in contact with the treated magnesium

panel has no coating, the exterior side is painted. One disc was placed in contact with each side of a 4" x 6" treated magnesium panel having a ¼" hole in the center. The discs and panels were held together by a nut and a screw passing through a plastic sleeve, and with a plastic washer on each side to insulate the screw and nut from the discs and panel. Panels having the dichromate treatment and an anodic proprietary treatment were used as references. The assembled panels were placed at 15° from the vertical on blocks and exposed to the salt spray. The HAE treated panels were unaffected while the other panels were badly corroded.

Figure V shows the appearance after exposure to the salt spray of treated magnesium panels dipped in a 15% microcrystalline wax solution in toluene. The wax treatment was applied before the panels were assembled with the dissimilar metal discs. At the end of 46 hours' exposure the waxed HAE treated panels showed no signs of corrosion while the other panels showed heavily corroded areas. In each case drainage of corrosion products was toward the bottom of the panels.

Figure VI shows the appearance after exposure to the salt spray of treated magnesium surfaces given the following paint system:

a. Zinc chromate primer, U. S. Army Specification 3-201

b. Olive drab enamel, Federal Specification TT-E-485

c. Baked 45 minutes at 250°F.

The paint system was applied before the panels were assembled with the dissimilar metal discs. At the end of 165 hours' exposure, the painted HAE treated panels showed stains due to copper and aluminum corrosion, while the other panels were badly corroded and perforated. Galvanic corrosion is the main limitation in the use of magnesium alloys. One coat of zinc chromate primer and one coat of olive drab baking enamel over the relatively high dielectric strength of the HAE coating overcomes this shortcoming of magnesium alloys and opens the field to wider application of magnesium.

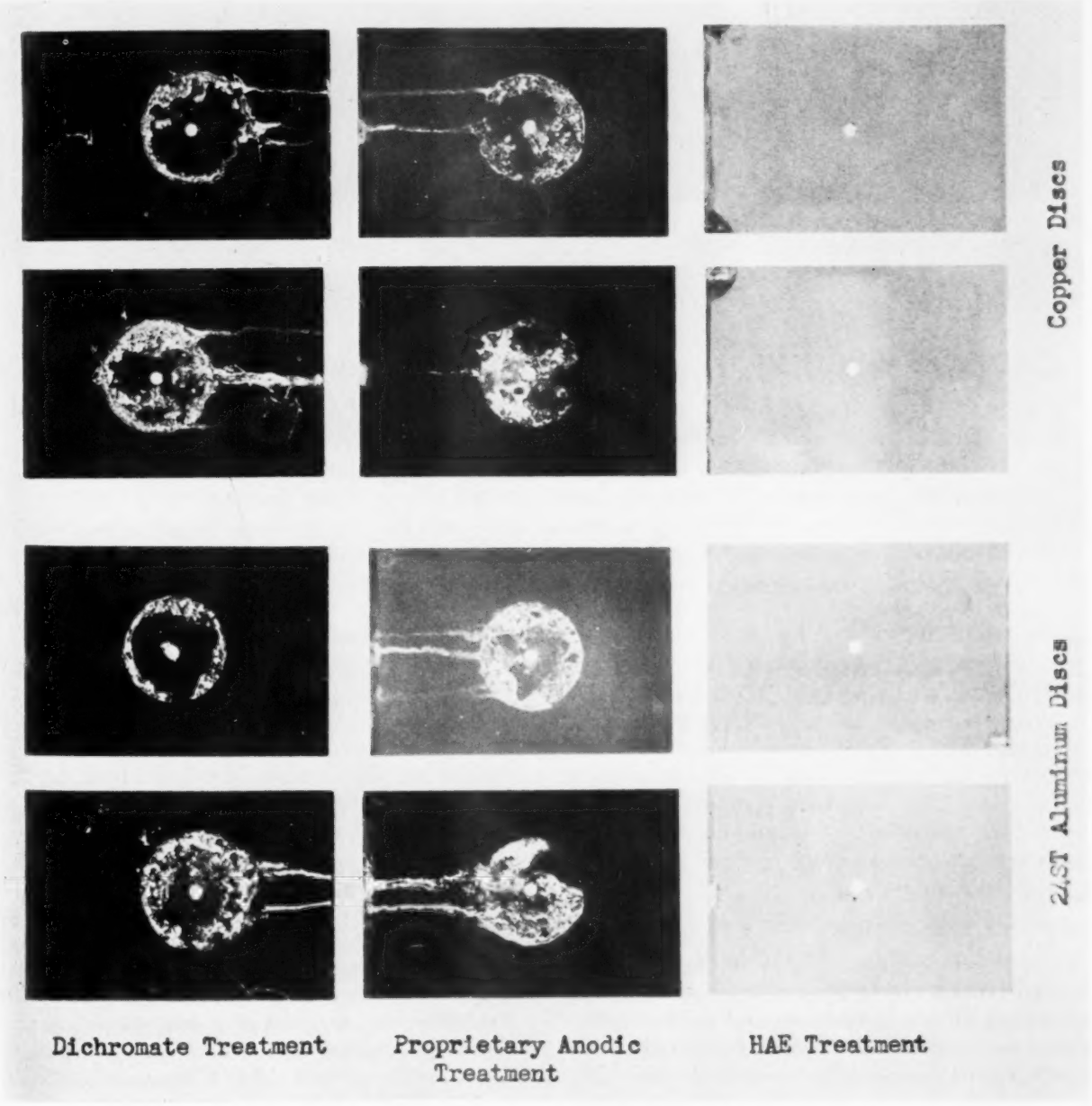


Figure 5. Treated and waxed magnesium alloy panels after a 46 hour salt spray test.

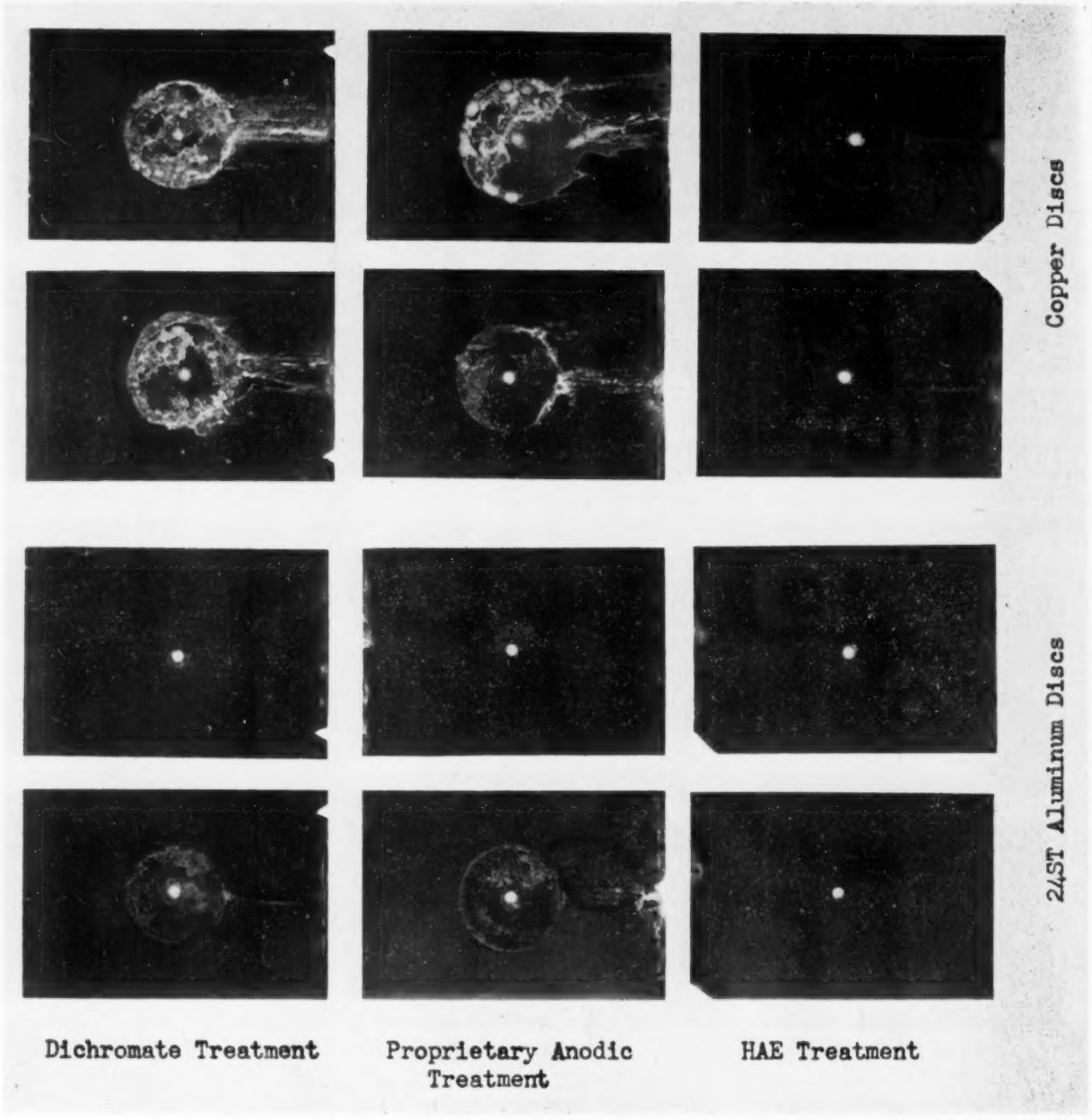


Figure 6. Galvanic corrosion of treated and painted test panels after 165 hours of salt spray exposure.

Abrasion Resistance

The HAE finish was tested on a Taber Abraser. Results of abrasion tests using Calibrase wheels CS17 and the 1000 gram weight showed no breakdown of the coating after 3000 cycles. Specimens having dichromate and galvanic anodize treatments showed a breakdown after 5 cycles. The breakdown point on the Taber Abraser was determined by establishing low voltage contact between one edge of the specimen and a point on the abraded surface.

Flexibility

A magnesium alloy panel of .025" thickness bearing the HAE coating can be bent as much as 160° and straightened without apparent damage to the coating on the tension side. However, the coating on the compression side is substantially removed by this treatment. The relatively inelastic nature of the coating does not favor flexing.

Tensile Strength

The loss of tensile strength of HAE treated specimens of .022" thickness is 8 percent. This is largely due to the loss of magnesium metal in the conversion to the coating. However, as the thickness of the specimens increase the loss in tensile strength due to the HAE treatment will diminish, becoming negligible on the larger specimens.

There are no conclusive data on the fatigue life of the HAE coating. However, promising results have been reported by other agencies conducting fatigue tests.

At present, the process is available for military applications only. Manufacturers working on government defense contracts dealing with magnesium parts and desiring further information may contact the *Office, Chief of Ordnance, ORDTB, Washington 25, D. C.*, through their contracting or supervising defense agency.

Determination of Small Amounts of Cyanide in Polluted Water

By I. Nusbaum and Peter Skupeko,

Supervising Sanitary Chemist and Sanitary Chemist, respectively, Sewage Treatment Plant, Detroit, Mich.

The determination of cyanides in waste waters in the range below 1 p.p.m. has always been difficult and inaccurate. The authors present here a colorimetric method that is accurate and reproducible in the range .02-.5 p.p.m., directly on the waste water. Lower or higher cyanide ranges can be handled, and metallic complex cyanides do not interfere and can be determined separately from the "free cyanide."—*Ed.*

THE ultimate aim of the analytical chemist, and particularly the chemist whose principal duties are the determination of microquantities of pollutants in industrial wastes, sewage, and polluted waters, is the discovery and use of methods requiring little or no manipulation to obtain a reasonable degee of accuracy with a minimum of interference. The determination of free cyanides in sewage and polluted waters has been provided the analyst with serious difficulties, particularly in concentrations of cyanide ion up to 10 p.p.m. Because many stream standards and objectives now being formulated and in use set standards such as not to exceed 1 p.p.m. cyanide in the effluent from municipal and industrial plants or systems, or 0.1 p.p.m. cyanide in the stream, it becomes necessary to establish a method which will indicate with some degree of certainty cyanide present in small amounts.

Sensitivity in the required range is reported for methods utilizing phenolphthalin, o-cresolphthalin,[1] Prussian blue,[2] pyridine-pyrazolone mixture with cyanogen halide,[3] and pyridine-benzidine with cyanogen halide.[4,5]

The methods, as applied previously, require the separation of the cyanide from the original solution for several reasons, among which are the presence of interfering substances to the reaction, and turbidity interfering with colorimetric analysis and not easily removable by filtering. It was decided to investigate the methods as to the possibility of some modification which would permit the determination of cyanides directly on the original sample. This eliminated the phenolphthalin and o-cresolphthalin methods. These methods are non-specific for cyanides and must usually be applied to samples which have been concentrated by distillation.

The Prussian blue method[2] requires the volatilization of the cyanide and its absorption on treated filter paper, and is thus subject to similar errors of separation. It was discovered that the presence of small amounts of ferro- or ferricyanides in the sample would on distillation break down, releasing cyanide and causing appreciable errors in the microdetermination. The pyridine-pyrazolone color development[3] was found to be dependent upon the presence of a small amount of bispyrazolone and required additional manipulation and the preparation of a relatively unstable reagent. Preliminary investigation indicated that the pyridine-benzidine reaction with cyanogen halide as performed by Aldridge[4,5] had the necessary sensitivity and stability. This reaction and the pyridine-pyrazolone reaction are variations of the König synthesis[6] for the preparation of colored substances by reacting cyanogen chloride or bromide with pyridine and an aromatic amine. A large number of amines will perform substantially as benzidine and phenyl 3-methylpyrazolone do, with varying colors and degrees of sensitivity.

Aldridge's method could not be applied directly with accurate results to turbid waters, because turbidity in the sample would interfere with the use of a photelometer or spectrophotometer. In addition, the method was limited to the presence of approximately 0.3 microgram per ml. of sample, which would limit the lower range of the quantitative determination to 0.3 p.p.m. CN. By performing the determination in the presence of n-butyl alcohol, and extracting the dye formed with the n-butyl alcohol, the sensitivity of the method was extended. The butyl alcohol extract was free of turbidity and the colors formed could be easily compared visually or photometrically.

Apparatus and Reagents

A Beckman spectrophotometer, Model B, with 1-cm. cuvettes was used in establishing the wave length of maximum extinction and a calibration surve.

The reagents required are as follows:

1. Phosphoric acid solution, 10 per cent.
2. Bromine water. It is not essential that this solution be saturated.
3. Sodium arsenite solution, 2 per cent.
4. n-butyl alcohol, reagent grade.
5. Pyridine solution, 25 per cent, containing 2 ml. conc. HCl per 100 ml.
6. Benzidine HCl solution, 2 per cent.
7. Standard cyanide solution containing 1 microgram CN per ml. (1 p.p.m.). Prepared by diluting a 1,000-p.p.m. CN solution standardized by the Liebig method.

Procedure

To a 10-ml. sample of sewage or other material to be tested, containing up to 5 micrograms cyanide, add 2 drops of 10 per cent phosphoric acid and several drops of bromine water until the mixture shows a slight excess of bromine by the presence of the color

of free bromine. Add sodium arsenite solution drop by drop until the color disappears, and then add one extra drop. Add 10 ml. n-butyl alcohol, stopper, and shake. Prepare the pyridine-benzidine reagent by mixing 5 ml. 25 per cent pyridine solution and 0.3 ml. 2 per cent benzidine solution, and add to the sample-butyl alcohol mix. Stopper and shake vigorously. Permit the color to develop for at least 15 min. before comparing the orange color which develops in the alcohol layer. Separate the butyl alcohol extract and compare visually or photometrically.

Standards may be prepared by taking up to 5 ml. of the cyanide solution containing 1 µg. per ml. and diluting to 10 ml. In a 10-ml. sample this represents up to 0.5 p.p.m. CN. Should the unknown solution contain in excess of 0.5 p.p.m. CN, it may be compared with a curve based on a 10-ml. sample by diluting an aliquot to 10 ml. with distilled water. Using a standard sample size of 10 ml. eliminates the variation in volume of the extract, which might result due to the solubility of n-butyl alcohol. Should the unknown contain less than 0.1 p.p.m. CN, a 100-ml. or 200-ml. sample may be used, the extraction being performed with two successive 10-ml. portions of n-butyl alcohol. A new calibration curve should be made for the larger sample size and larger amount of extracting solvent. For the n-butyl alcohol there may be substituted n-amyl alcohol, which is much less soluble in water than the butyl alcohol.

Discussion

A sample containing a small amount of the standard cyanide solution was prepared and the butyl alcohol extract of the color obtained. The orange-colored extract was placed in the spectrophotometer and the wave length of minimum transmittance (maximum extinction) was obtained. The wave length was 480 millimeters. All subsequent measurements in the spectrophotometer were made using a wave length of 480 millimicrons. Table I is an example of the data obtained using sample known for a calibration curve. In plotting the data, the method recommended by Ayres[7] was used. In this method absorptancy is plotted against the log of the concentration, absorptancy being

Table I.—Calibration Curve Data

(Beckman Spectrophotometer, Model B, Wave Length, 480 Millimicrons; 1-Cm. Light Path)

CN Added (µg/10 ml.)	Transmittance (%)
0.25	87.0
0.50	76.9
0.75	67.0
1.00	58.5
1.50	43.8
2.00	34.0
2.50	27.2
3.00	20.1
4.00	11.5
5.00	6.1

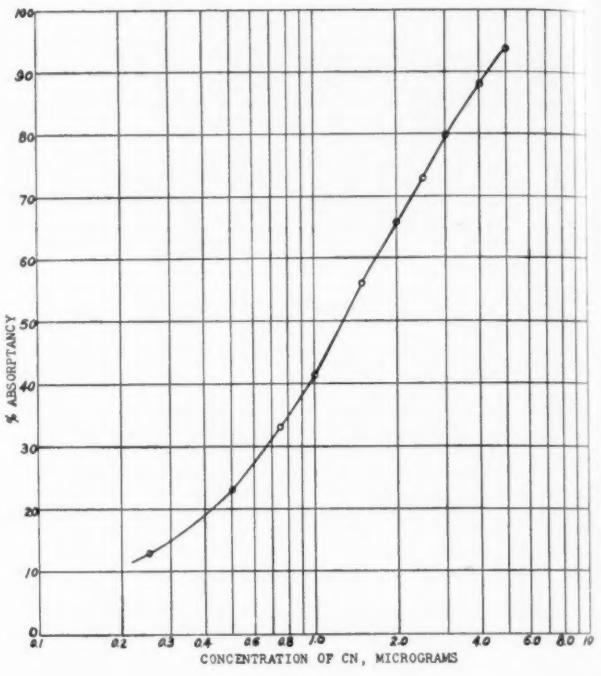


Figure 1

defined as 100 minus the transmittance, in per cent. This curve (Figure 1) not only directly indicates conformance to Beers' law, but also indicates a suitable concentration range for the determination. The curve indicates that the determination may be used with a reasonable degree of accuracy from 0.4 µg. to 5 µg. CN (representing 0.04 to 0.5 p.p.m. CN in a 10-ml. sample). The range can be extended to 0.2 µg. with a slight decrease in accuracy. In using the above method of plotting data, the range of determination can often be extended by establishing a curve starting with a solution of known concentration instead of using a blank of zero concentration.[7] The color was checked for stability in the spectrophotometer by permitting the samples to stand from 15 min. to 2 hrs. There was practically no readable change in intensity.

A serious source of error in Aldridge's method[4,5] may be caused by the time lapse between the addition of the pyridine and benzidine, as he did not recommend mixing the reagents prior to adding to the sample. It was found that if a period of 1 min. lapses between the addition of the pyridine and benzidine, the color development is 50 per cent less than if the reagents are added simultaneously. If the intervening period is increased to 3 to 5 min., the color fails to develop. This accounted for the irregularities which occurred during the preliminary work. The pyridine-benzidine reagent, if mixed in quantity, develops a slight amber color in about 24 hr., which does not change in a two-week period. This reagent may be used if the calibration curve is established with the same reagent.

Thiocyanates will also react with chlorine or bromine to produce cyanogen chloride or bromide, and the method may also be used to determine thiocyanates quantitatively. However, the presence of thiocyanate in the sewage sample being analyzed will give high results for the determination of free cyanide. This may be corrected for by first determining total

cyanogen halide producing substances as CN, acidifying another portion of the sample with boric acid, heating to 90° to 100°C. in a water bath, and aerating for 5 to 10 min. The residual color-producing substance may then be determined and deducted from the total cyanide to yield free cyanide.

It is also possible to differentiate between zinc and copper cyanide complexes and free cyanide by the use of the pyridine-benzidine reaction. Cyanogen chloride or bromide is readily formed by adding the halogen to these complexes, as well as to free cyanides. However, the complex is not disturbed by acidifying with boric acid, heating, and aerating as above. Therefore, when the reaction is carried out in this manner the residual color will result from thiocyanate plus the complexed cyanide.

The thiocyanate can be differentiated from the combined free and complexed cyanide by acidifying a 10-ml. portion with 2 drops of 10 per cent phosphoric acid instead of boric acid, heating, and aerating for 5 min. This will drive off the HCN produced from the complexes and the free cyanide, and the residual color-producing substance will be thiocyanate.

Only one other source of interference has been found and this may be corrected for as above. Ferricyanides, ferrocyanides, and cyanates have no effect. Oxidizing and reducing agents, which might interfere, are, in general, removed by the bromine and sodium arsenite. It was found that samples containing an appreciable amount of protein, or partially hydrolyzed protein substances, such as gelatine, casein, peptone, and tryptose, would give a positive test for CN or CNS. Analysis of the color in the spectrophotometer showed that the wave length of maximum extinction for the n-butanol extract was identical at 480 millimicrons with that developed from cyanide or thiocyanate.

A search of the literature revelaed that amino acids may be oxidized to cyanides, as follows[9]:

$$\begin{array}{l} R\,C\,H\,C\,O\,O\,H \rightarrow R\,C\,H\,C\,O\,O\,H \rightarrow RCN + 2HCl + CO_2 \\ \quad\;\; | \qquad\qquad\;\; | \\ \quad NH_2 \qquad\quad NCl_2 \end{array}$$

In the case of glycine,

$$\begin{array}{l} CH_2COOH,\,HCN \\ \quad\;\; | \\ \quad NH_2 \end{array}$$

is formed, which in the presence of excess bromine forms CNBr, thus giving a positive test for cyanide.

A number of other pure amino acids were tried with negative results.

Table II. — Comparison of Added CN and Amount Determined by Use of Calibration Curve (Figure 1)

CN Added (μg./10 ml.)	Transmittance (%)	CN Found (μg.)
0.0	90.0	0.2
0.5	69.0	0.7
1.0	49.0	1.2
1.5	40.3	1.7
2.0	31.0	2.2

Chlorine or bromine will not form the cyanogen halide when reacting with nitriles or other organic compounds with CN groups.[8] It must be recognized that cyanogen halides are extremely reactive materials, and it is possible that some substance may be present in the sewage that will destroy the CNBr as rapidly as it is formed. In the large number of sewage samples containing many forms of industrial wastes that were analyzed, no such interference was found. Table II was prepared by using a sample of domestic sewage containing little or no industrial waste. Total CN + CNS on the sample as received (by extrapolating on Figure 1) was 0.2 micrograms as CN in a 10-ml. sample. As the data sought concerned substances present in the sewage which would cause erratic results, this quantity was not subdivided. To the sewage, various amounts of CN were added, with the results as shown.

Summary and Conclusions

By means of the modified pyridine-benzidine reaction with cyanogen halides, free cyanide may be determined directly in sewage or polluted waters in the range of 0.02 to 0.5 p.p.m. with a reasonable degree of accuracy and with little interference. The range may be extended by diluting samples with greater concentrations or using a larger sample for lower concentrations of CN. Thiocyanates may be similarly determined. The reagents are simple to prepare, stable, and readily available.

Acknowledgments

The authors wish to express their appreciation to the Detroit River Section, Michigan Water Resources Commission, for the use of the spectrophotometer; and to L. Meyerson, senior sanitary chemist, Detroit sewage treatment plant, for technical advice and assistance.

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Abstracts of A. E. S. Convention Papers

Rinsing for Electroplating

By *R. J. Rominski and F. L. Clifton, General Motors Research Laboratories, Detroit, Mich.*

The rinsing operation in electroplating should not be thought of as an independent step in the plating sequence. It is intimately related to the preceding and succeeding operations, and rinsing techniques should be engineered from this viewpoint. The cost and efficiency of each step in the cleaning cycle is directly influenced by the intermediate rinsing steps, and the success or failure of the plating operations may depend wholly on the proper choice and efficient operation of the rinsing techniques.

The selection of one of the three common types of rinsing, i.e., still tank, spray, or fog, must be made on the basis of both technical and economic considerations. Each has advantages and disadvantages which must be evaluated for each application.

There are several variations for even so simple an operation as still-tank rinsing. Agitation is an important variable, and can be achieved in a variety of ways. Movement of the water or the work, or both, is desirable, but the nature of the movements, their extent and duration must be tailored to fit the work being rinsed.

Spray rinses are usually used in connection with still-tank and hot-water rinses, and offer savings in several ways, e.g., by keeping the final hot rinse cleaner, by causing less spotting of the work, and by reducing the steam consumption in the hot rinse.

Fog rinses are often used on racked work as it comes out of the plating solution. They are capable of reaching more remote recesses than spray rinses, and because of the small volume of water required, attractive applications which decrease drag-out losses and reclaim-rinse volume can be engineered.

It is a mistake to neglect the possibilities of economies, both direct and indirect, and of superior technical operation which may accrue from the use of purified or treated water in many rinsing operations. Modern techniques for softening, demineralizing and distilling water present the plater with an attractive array of possibilities from which he can select those best suited to his problems.

Practical Applications of Diaphragm Tanks in the Electroplating Industry

By *Ezra A. Blount, Editor, Products Finishing Magazine, Cincinnati, Ohio.*

The simplest form of diaphragm-tank installation comprises a tank which is separated into anode and cathode compartments by means of porous diaphragms, plus auxiliary equipment for pumping the solution from the anode compartment, through a filter, and back into the cathode compartment. This elementary arrangement may be modified to include heat exchangers, electrolytic purification tanks, and other special equipment which may be required in a particular process.

Although the obvious advantage of the diaphragm tank is the elimination of individuals anode bags, which are a nuisance with nickel and a virtual impossibility with high-speed copper, it has been found in practice that other benefits may be realized. Higher anode current densities may be used; roughness caused by stray dust, dirt from make-up chemicals, or other sources is reduced, and it is easier to buff the plated work. It must not be imagined, however, that diaphragm tanks will solve all plating troubles, and there are even sources of roughness which will remain operative.

Experience has shown that although conventional tanks can sometimes be converted successfully into diaphragm tanks, it is best to install new tanks complete with all accessory equipment. Only in this way can optimum arrangements be made for all parts of the system, particularly means for removing solution from the anode chamber and introducing it into the cathode chamber.

Although 11- or 12-oz. canvas duck, with a service life of from six months to a year or more, is the most popular diaphragm fabric, a number of synthetic materials have been investigated. Nylon, Dynel and Chemstrand are among those which show promise.

The diaphragm-tank system has no limitations, small or large, so far as size is concerned, and its benefits may be realized in the laboratory, in the small job shop, or in an enormous automatic line.

Methods of Heating and Temperature Control of Plating Solutions

By *W. E. Stadel and C. Civan, George L. Nankervis Company, Detroit, Mich.*

Accurate control of plating-bath temperature is necessary for the successful operation of modern plating processes. The permissible range of temperature variation is usually $\pm$ 5°F., but in some cases the fluctuations must be limited to $\pm$ 2°F.

Steam is the usual source of heat, and it may be used in either internal coils or external heat exchangers. Internal coils are satisfactory for alkaline cleaners, hot acid dips, strikes and other solutions of comparatively small volume, but the contents of large tanks should be heated by means of external heat exchangers. In these cases it is important that the hot solution be returned to the plating tank through a series of headers located at the bottom of the tank and protected with suitable grids.

The size of a heating coil or heat exchanger may be calculated from the specified heat-up time, capacity of tank, operating temperature, and steam pressure. It is not usually necessary to consider heat losses caused by radiation or the introduction of cold work inasmuch as the excess capacity required for heat-up

will cover all heat losses incurred during normal operation.

Iron equipment can be used for alkaline cleaners and for cyanide strikes which contain no organic material. Acid-resistant materials must be used for internal and external apparatus for the handling of acid solutions. Steel pipes lined with rubber or plastic are suitable for most acid baths.

Air-operated controllers are recommended where close temperature control is required, and they may be adapted for either heating or cooling or both. Self-operating instruments which are actuated by vapor pressure from a thermal element in the solution may be used where comparatively coarse control is adequate.

Advantages of Simplicity in the Electroplating of Automobile Bumpers

By *Donald H. Schantz, Assistant Vice President, Michigan Bumper Corporation, Grand Rapids, Mich.*

When preparations were made to resume production of automobile bumpers after World War II, the pre-war plating sequence was investigated to determine if a simplification would lead to improvements in quality and costs. A promising and important possible simplification was the elimination of the copper flash, which would not only reduce the number of steps in the sequence but would also reduce waste-disposal problems.

In the new sequence, cleaning is done in two steps. The first is an anodic cleaner, and the second makes use of alternating current to demagnetize the bumpers and prevent the accumulation on their ends of iron particles which lead to roughness in the nickel deposit. All rinsing is done in spray-rinse tanks.

The key to successful adhesion of the nickel directly to the steel lies in the use of an anodic treatment in a solution of 65-70 per cent by volume of 66° Bé sulfuric acid at 60 asf and 80-100°F. for 1.5 min., followed by a rinse prior to nickel plating. It has been observed that this treatment is responsible for a small amount of smoothing of the steel surface.

The substitution of a proprietary semi-bright nickel solution for a low-*p*H Watts bath and other changes in the nickel plating operation permitted an increase in current density and a decrease in buffing costs.

Cathodic cleaners are used in preparation for chromium plating, and oxidation of the nickel is thereby kept at a minimum. The work is treated for a few seconds at low voltage in the chromium-plating tank under conditions which do not deposit any metal before the working voltage is applied. This helps to secure a bright chromium deposit. Occasional rejects owing to cloudy chromium are stripped of chromium and replated.

The product is believed to be equal if not superior to that produced by more complicated sequences. The cost has been low, and the production has been twice that originally expected.

Requirements of Zinc Base Die-Castings for Electroplating

By *Glenwood J. Beckwith, Vice-President and General Manager, Metallon Products, Inc., Los Angeles, Calif.*

Zinc-base die-castings which are suitable for electroplating can be produced only when due care is exercised with regard to the design of the article, the design of the dies, the casting technique in the foundry, and the composition of the zinc alloy.

The design of the article should be such that polishing can be easily accomplished without expensive special equipment or excessive hand labor. The designer should also keep in mind the requirements of the plater with respect to ease of racking for good contact, proper drainage, and satisfactory throwing of metal to all parts of the article.

A die which is not properly designed will be the source of castings that contain coarse-grained areas, cold shuts, rough surfaces, and other defects which cause the plater a great deal of trouble and may lead to a ruinous number of rejects. Even trimming dies which are not properly aligned or are otherwise faulty will produce castings that are hard to polish, and the excessive polishing may very well cause plating troubles.

Foundry technique which does not recognize the effects of metal and die temperatures, lubricants, poor skimming, and the use of excessive amounts of scrap in the pot will inevitably lead to poor castings that will be difficult to plate properly. Even the type of furnace is important. A gas-fired furnace, for example, may be the cause of porous castings if the metal is exposed to the products of combustian. Probably no single factor is so important as proper foundry technique in the production of good castings.

Some of the impurities which may find their way into die-casting alloys can be the source of important plating troubles. Lead and cadmium are particularly troublesome, and even small amounts will cause blistering after plating. Many other impurities, such as tin, promote subsurface corrosion and cause effects which may be blamed upon the plater.

Chemical and Electrochemical Preparation of Zinc Base Die-Castings for Electroplating

By *Earl W. Arnold, Technical Service Engineer, L. H. Butcher Company, Los Angeles, Calif.*

The preparation of zinc-base die-castings for plating consists of a precleaning operation, electrolytic cleaning, and an acid dip or etching operation.

The precleaning, the function of which is to remove contamination to a point where the electrolytic cleaner is effective, can be accomplished by organic-solvent cleaning, emulsion soak and spray, or alkaline soak. Organic solvents can be used in the vapor, spray, or immersion techniques or combinations thereof depending on the size and shape of the parts being cleaned and the nature of the soil. Emulsion cleaners are particularly useful for zinc-base diecastings in that they are effective, economical and do not attack the base metal even on long exposure. They lend themselves to use in a wide variety of ways, including power-washing machines. Precleaning with alkaline-soak cleaners should be limited to those cases where contamination is slight, but such cleaners have the advantage of low initial cost and maintenance.

Electrolytic cleaning may be either anodic, cathodic, or a combination of both, but with any of the techniques, care must be exercised to see that the surface of the die-casting remains virtually unchanged after

going through the electrolytic-cleaning cycle. Although the composition of the cleaner is important, the success of the operation depends largely on such factors as temperature, concentration, cleaning time and current density. It is important to replace the cleaner frequently, or trouble from blistering or poor adhesion will be encountered.

Perfect adhesion of the deposit to zinc-base diecastings can be obtained only when all harmful films have been removed from the casting. The proper acid dip will eliminate surface oxides and chemical films from previous operations. Sulfuric, hydrochloric, hydrofluoric, or fluoboric acids may be employed satisfactorily when used under the proper conditions, and phosphoric and acetic acids have found some favor. The time for immersion is determined by the first signs of gas evolution. Rinsing after acid dipping should be thorough to prevent contamination of solutions in subsequent operations.

Electroplating Zinc-Base Die-Castings

By *Chester G. Borlet, District Manager, United Chromium, Inc., Los Angeles, Calif.*

One or more of a large number of metals may be deposited on a zinc-base die-casting, but all coatings must conform generally to specifications which cover general appearance, arrangement of multiple deposits, minimum thicknesses, resistance to salt-spray, ductility, and adhesion.

In all of the plating processes employed in meeting the specifications, careful control must be exercised over the variables which are responsible for the success of the plating operation. The variables can be divided into two categories, namely, internal variables, comprising composition, *p*H, temperature, current density, and impurities; and external variables, which include rinsing, agitation, current source, plating racks, and filtration.

Even though all components of a plating solution may be present in the correct relative amounts, excessive or insufficient total concentrations may result in poor deposits. Some baths are particularly sensitive to *p*H, and must be controlled very carefully. Current density and temperature are closely inter-related, and the selection of operating ranges for each of these variables requires a careful consideration of many factors, among which the geometry of the work and the current distribution on it are of utmost importance. Impurities are a fruitful source of plating difficulties, but techniques for their removal have been well established.

Sufficient rinsing facilities should be provided to remove all chemicals from the work before it goes to the next operation. The necessity of continually replenishing the solution around the cathodes requires agitation, which may be accomplished in a number of ways, either mechanically or pneumatically. Whatever the current source, it should be designed for the work in hand and operated under the conditions of load for which it was designed. Well-engineered racks properly coated with an insulator which will not contaminate the solution are required for the production of good deposits. Proper filtration helps immensely in the avoidance of rough deposits.

Mechanical Finishing of Zinc Die-Castings Prior to Plating

By *M. R. Caldwell, Assistant Vice-President, Doehler-Jarvis Corporation, Grand Rapids, Mich.*

A properly designed die with a well-polished and chromium plated cavity should produce die-castings with a surface that would need no buffing prior to plating. However, even in the absence of surface defects as the casting is removed from the die, the parting lines must be trimmed off and polished, and these operations generally cause nicks and scratches that necessitate buffing of the entire bright area.

The dense "skin" on the casting should be preserved during buffing in order that the number of corrosion spots in use be kept at a minimum. Only very shallow pores in the surface can be bridged during copper-nickel plating; others can be removed by polishing or hand buffing for maximum corrosion resistance. However, air pockets in shallow pores will expand during baking of the plated castings and raise blisters.

Machine finishing is a necessity to reduce cost and meet production requirements in the author's plant with its large production—in 1950, 280,000 castings daily, weighing 0.43 lb. on the average and 15.5 lb. maximum.

Size and contour, required final finish, presence of holes and threads, possibility of distortion, and adaptability to automatic machine polishing are factors which are taken into account in the choice of finishing method.

Many small parts are barrel burnished, sometimes after a strapping (belt polishing) of the parting line, in 2-compartment, 32-inch diameter, 60-inch long barrels, run at 30 rpm at first and then 6-10 rpm for final coloring.

Parting lines are usually strapped, by hand or automatically, before buffing. Abrasive belts are preferred to set-up wheels because of elimination of skilled labor and savings in material and labor. Polished areas and coarseness of polishing grain are continually kept at the minimum required by the condition of the part, and use of grease stick at a maximum, to reduce cost of subsequent buffing. Type of buff and buff speed are carefully selected for the same reason.

Liquid tripoli buffing compounds are rapidly gaining favor, even in hand buffing, and are carefully selected for minimum consumption, buff wear, and ease of removal by cleaning. Applications can be made automatic. The recirculating pump-type system is preferred over the pressure-can system because it eliminates transfer of compound and keeps it uniform.

A wide variety of automatic buffing machines are used: semiautomatic, reversing type with only one fixture (two to a part), straight-line and return-type full-automatic with fixture guides and tilting mechanisms. Areas not reached on the machine are touched up by hand, sometimes with a portable high-speed head when the fixture is turning an end of a return-type automatic.

Optimum wheel pressure, once set, is controlled by an ammeter on the motor, which automatically considers the wheel speed.

Phosphate Coatings

By *Alfred Douty, American Chemical Paint Company, Ambler, Pa.*

When one compares the manifold purposes for which electrodeposits and phosphate coatings have been used, one finds that the two have many common objectives, as well as applications which are specific to each of them. But in those applications which appear to be common, one kind of coating or the other is often more frequently employed for a specific purpose. Metal finishers should be familiar with the possible applications of each type of phosphate coating if they are to use it either as a first choice or as a substitute.

Phosphate coatings are commonly applied to iron, steel, zinc, cadmium and aluminum surfaces. Zinc, manganese or iron phosphate coatings are used with ferrous materials, the choice being dependent on the type of alloy which is to be treated. Zinc phosphate films are applied to both zinc and cadmium surfaces, and aluminum can be processed for the formation of either a crystalline zinc phosphate or an amorphous aluminum-chromium phosphate. Almost without exception, the coatings are given a supplementary treatment with paint, protective oils, or waxes.

Many techniques, such as dipping, spraying, hand brushing and tumbling, may be used to build up coatings of weight ranging from 30 to 4000 mg./ft.^{2}

Relatively thin coatings are best as substrates for paints and organic coatings. The actual weight depends upon the nature of the work and the amount of deformation to which it may be subjected after phosphating. Heavy films should be used where the supplementary treatment involves oils or waxes. Manganese phosphate coatings are particularly adapted for friction surfaces, alkaline exposures, and high-temperature environments.

Maximum corrosion resistance and minimization of paint blistering can be obtained when the phosphate coatings are given a final rinse in dilute chromic acid with or without phosphoric acid.

Chromate Treatments

By *Charles W. Ostrander, Allied Research Products, Inc., Baltimore, Md.*

Chromate treatments are employed to prevent the formation of voluminous white corrosion products on zinc and cadmium surfaces, and to polish or color these metals.

Chromate conversion coatings on zinc, cadmium and in some cases aluminum surfaces are produced in three basic types of chromate solutions operated at pH's below 7. Within each type there are variations in procedure or conditions of operation which will lead to films having specific colors, corrosion resistance, or other properties.

The simple dip solutions for chemical polishing are operated at pH values of 0.0-1.5, and in 5-60 sec yield lustrous coatings of medium corrosion resistance on zinc and cadmium which range in color from clear to light iridescent yellow.

Single-dip non-polishing solutions operated at pH 1.0-3.5 will produce in from 5 sec to 5 min medium-to-heavy films ranging in color from iridescent yellow to bronze, olive-drab and black. Such films provide maximum corrosion protection, and, with the exception of black films, can be dyed red, green, blue or black with certain alizarine and diazo dyes. This general type of solution and procedure is applicable to aluminum and its alloys as well as to zinc and cadmium.

The solutions which require anodic treatment of the work will produce yellow-to-black films on zinc at current densities of 5-50 asf at pH values of 2.5-6.0 in 3-5 min. They find use in the aircraft industry for the production of black films and in the refrigeration industry for clear films.

All of the solutions are operated at low temperatures ranging from 60 to 100°F., and the equipment required is very simple. Although the solutions may be compounded by the user, there is an increasing tendency to employ proprietary mixtures for ease and reliability of operation.

Black Oxide Coatings on Metals

By *Walter R. Meyer, President, Enthone, Inc., New Haven, Conn.*

The purposes for which black oxide coatings may be applied to iron, steel, copper, stainless steel, zinc, cadmium, and aluminum include substitution for other finishes, low light reflectivity, color contrast, economy, reduction of friction, and resistance to flaking.

The black oxidation of iron and steel may be accomplished by heat tinting, oxidation in fused nitrate baths, or oxidation in aqueous alkaline solutions. The aqueous alkali process is the most widely used, and there are modifications of it which may be employed under various conditions of time and temperature to produce coatings with a variety of properties. Nitrates, nitrites, chromates and chlorates are common additions to the sodium hydroxide solutions. The coatings produced by any of the processes provide only limited corrosion protection, and the finish should be protected with oil. Stainless steels are usually treated in a bath of fused sodium dichromate, which will yield a coating with excellent corrosion resistance and colors that are dependent on the time of treatment.

The velvety coatings which are produced on copper with a sodium hydroxide solution containing an oxidizing agent can be polished by wiping or tumbling. Oxide coatings formed on copper in this and other ways are excellent bases for organic finishes.

Black coatings on zinc and cadmium consist of other metals or oxides deposited from black nickel, molybdate or chromate solutions. The various deposits differ in their corrosion resistance, wear resistance, and other properties, and selection of a process depends on the end use of the product.

The best method of treating aluminum involves the dyeing of an anodized coating.

There are upper limits of temperature to which black oxide coatings can be exposed without detrimental effects.

Rust Preventives

By *Arnold W. Ackerman, Research Director, F. E. Anderson Oil Company, Portland, Conn.*

Rust preventives differ from other metal finishes in that they are readily removable with cheap solvents. They can be divided into three main classes, namely,

fluid materials applied at room temperature in solvent solutions, solid materials applied hot, and lubricating oils. The first two are superior to the third, and most field problems can be handled by the first.

Surface preparation and cleaning are as important as in other metal finishing processes, and selected standard cleaning techniques can be used.

The choice of rust preventive material depends upon the type of exposure and the degree of protection required, the composition of the work to be preserved, the type of finish, the design and complexity of the work, whether or not the preservative is to provide other functions such as lubrication or the hydraulic transmission of power or movement, and the nature of the packing, if any, to be used over the preservative.

Within the framework of these requirements there are many details which must be properly evaluated to determine the most suitable material.

The methods that are used to evaluate rust preventives include salt-spray test, high-humidity tests, immersion in fresh or sea water, weatherometer test, indoor and outdoor exposures of all sorts, water-displacement tests, and fingerprint-removal tests. Experience has shown that the accelerated tests are not as reliable as those in which no substitution is made for elapsed time. Pressure effects, which are seldom encountered in other metal finishing operations, are often of importance and must be taken into consideration if test methods are to be significant.

Special problems which are peculiar to the rust preventive industry include dermatitis, which may arise from the handling of some materials, and the fire hazards that accompany the use of volatile and flammable solvents.

Organic Coatings in Today's Metal Finishing

By Donald R. Meserve, United Chromium, Inc., Carteret, N. J.

Clear lacquers or synthetics are often used in normal times to supplement metallic finishes, but when shortages of metals for plating occur, these organic coatings can be used in other ways to make bright metal finishes possible in spite of governmental restrictions on the use of critical metals such as copper, nickel and brass.

Bright chromium plate without an undercoating of nickel would not be a practical finish for most conditions of exposure were it not for the fact that special clear baking synthetics having the necessary hardness, clarity, gloss, adhesion, abrasion resistance, and resistance to humidity and salt atmosphere have been developed to protect and supplement the chromium. Long experience in the formulation of clear coatings for normal use in the hardware, sporting-goods and other industries has provided a sound background from which technologists have been able to progress rapidly in the development of organic coatings that have the desirable properties for new uses. Acrylic alkyd-urea-formaldehyde, and melamine-formaldehyde-alkyd resin combinations have been found to be the most suitable for metal-finishing purposes. Most specifications written for these materials are more stringent than those for the usual copper-nickel-chromium finishes. Dry-film thicknesses range from 0.0005 to 0.002 inch, and the films are baked for 20-30 min at 250°F. or as little as 7-10 min at 400°F. Excellent adhesion is possible when proper surface preparation is employed.

A chromium-like appearance can be attained with bright zinc which has been clear-dipped and protected with clear synthetics. The extensive use of this finish in the refrigeration industry has not only proved its value, but has also provided extensive experience in the detection and remedy of troubles which may be encountered.

Tinted clear coatings may be used to simulate gold, copper and brass, and can be applied to chromium, zinc, stainless steel and aluminum. Opaque, pigmented coatings are, on the whole, unsatisfactory as substitutes for metallic deposits, and consumer resistance to them is high.

Evaluation of Quality of Electrodeposited Coatings

By *Carl Durbin, Engineering Laboratories, Chrysler Corporation, Detroit, Mich.*

Quality is defined as the ability of an electrodeposited coating to give satisfactory performance in service. Evaluation of quality may relate to the suitability of a coating for a given use, or it may be employed in production control.

The safest method for the evaluation of a coating for a given use is a life test in service, but at the same time certain properties of the deposit that can be determined in a short time should be measured for use in production control. These laboratory measurements must be correlated with service tests.

The properties to be measured and the tests to be used to evaluate them depend largely upon the plated metal, the basis metal, and the intended use of the coating. Initial appearance, appearance after reasonable service, adhesion, thickness, internal stress, ductility, porosity, and hardness are some of the properties which can be determined directly or indirectly, and correlated with service life. The effects of thickness and adhesion are well known, but the relationships between internal stress and ductility and service life need a great deal of study. There is little doubt, however, that in at least some cases a combination of high stress and low ductility is detrimental. The controversial salt-spray test is of some assistance in the evaluation of coatings, but must be used with great care.

Of the properties that are commonly measured, thickness and hardness can be determined with good objectivity. Adhesion, stress, ductility, and porosity are more difficult to evaluate, and are usually measured on special test specimens rather than on the work itself. In most cases more than one test method for a given property is available, and a careful selection must be made according to the requirements of the coating and the basis metal.

A knowledge of the finishing cycle greatly facilitates estimation of the quality of deposits, especially when variables in the plating cycle have been correlated with service.

A New Degreasing Evaluation Test: The Atomizer Test

By *H. B. Linford and E. B. Saubestre, Columbia University, New York City.*

A special specimen which exhibits uniform drainage

for the evaluation of tests for degreasing processes has been designed and tested. It comprises a rectangular area of sheet metal with a tongue having an "S" bend at the top and a triangular extension at the bottom, and experience has shown that reproducible soiling and cleaning procedures can be carried out with it.

In the course of a study of tests which have been suggested for the evaluation of degreasing processes, it was found that a new procedure appeared to be far more sensitive than previous tests. The specimen to be evaluated is allowed to dry and is then sprayed for 30-45 sec with a dilute aqueous solution of a dye from an atomizer at a distance of 2 ft. with a pressure of about 18 inch of mercury. After being dried with a heat lamp, the specimen will exhibit a dye pattern which reveals the areas that were not free of oil or grease. Permanent records can be easily made by tracing the dyed areas with a pantograph. It is suggested that the superiority of the atomizer test over the water-break test is due to its dependence upon an advancing contact angle instead of a receding contact angle.

The atomizer test was compared with the fluorescent-dye, spray-pattern, ferricyanide and copper-dip tests for the evaluation of the residual oil on partially cleaned specimens which had been soiled with lard oil or mineral oil. When considerable residual oil remains on the specimen, the atomizer and fluorescent-dye tests have about the same equivalent sensitivity and are 20 times more sensitive than the other tests. The atomizer test improves as the amount of residual oil is decreased and for small amounts may become 20 times as sensitive as the fluorescent-dye test and 600 times as good as the ferricyanide test. Radioactive-tracer techniques may be this sensitive, but they are both expensive and technically difficult, whereas the atomizer test is so simple and cheap that it may be used in even the smallest plating shops.

Nickel Plating with Insoluble Electrodes

By *W. A. Wesley, D. S. Carr and E. J. Roehl, Research Laboratory, The International Nickel Company, Bayonne, N. J.*

Although a nickel plating process which involves insoluble anodes would not be attractive to the decorative-plating industry, it offers distinct advantages in such other fields as the plating of steel strip and wire, electroforming of screens, plating of rolls, and plating of the inside of tubes. The principal difficulty with the process in the past has been in devising means for replenishing the nickel content of the bath cheaply and with good control.

Replenishment can be accomplished on a continuous basis for a chloride-free nickel plating bath by means of a process which involves circulation of the electrolyte through a plating tank, a regeneration tank, and a filter. Nickel is dissolved in the regeneration tank at a controlled rate with the aid of periodic reversal of the current, and the pH of the solution increases. In the plating tank the nickel content of the electrolyte is depleted, and the pH decreases. If the electrode area in the regeneration tank is adequate, the composition and pH of the electrolyte can be controlled simply by adjusting the current in this tank. When the plating tank is operated at 40 asf, the regeneration tank can be run at 10 asf, and the pH held at 1.5. Under these conditions, the cathode current efficiency in the plating tank was 68 per cent, and the power consumption for dissolving nickel in the regeneration tank was 0.78 kw-hr per pound. The power costs for the regeneration cell are small, because it can be operated with close electrode spacing, a low current density, and a series-parallel electrode arrangement.

The nickel deposits from the chloride-free bath have approximately the same mechanical properties as those obtained from a Watts bath. The hardness and tensile strength are a little higher, and the ductility somewhat less.

The process does involve a problem in ventilation, in that copious quantities of gases are liberated at electrodes and give rise to considerable spray.

Operating Control for Optimum Plating Characteristics

By *R. O. Hull and J. B. Winters, R. O. Hull and Company, Inc., Rocky River, Ohio.*

By careful selection and use of simple but adequate control techniques, the operator of a small plating plant can avail himself of the many benefits which accrue from the scientific operation of plating solutions.

Mechanical and electrical variables should be controlled by a "foreman's check" at the beginning of each shift, and a list of items to be inspected is given.

Control of the plating solutions depends upon the results of chemical analysis and physical testing. Although there are many physical tests which may be employed, a plating test in a special cell will provide most of the information which the plater requires.

The concentration of primary constituents in the bath must be controlled by chemical analysis. Simple, reliable methods are given for all common plating solutions, and they will provide results which are sufficiently accurate for most operations.

The Hull cell, with which it is possible to make plating tests over a range of current densities in a single operation, is recommended for control of brighteners and impurities. The deposits prepared in the Hull cell, when interpreted in the light of experience and published information, yield information on bath variations before they begin to produce adverse effects in production plating. This is particularly valuable information, because the plater may use it to make corrections in the bath composition or operating conditions before he begins to produce the rejects that would otherwise be his only clue to the fact that something is wrong.

If the Hull-cell deposits indicate that trouble is imminent, experimental corrections can be made in the cell until corrective measures which give the proper deposit in the cell are found. This information, scaled-up in the proper proportion to tank size, may be used with confidence for the treatment of the bath without fear of ruining a large volume of solution.

A time chart showing when each test of the overall control routine is to be made is absolutely necessary if the utmost value is to be realized from control methods, for it is only in this way that trouble may be regularly detected before it causes damage.

(*Concluded on page 73*)

Practical Barrel Finishing—Part II

By Peter L. Veit, *Tech. Service Engineer, Oakite Products, Inc., New York, N. Y.*

The first installment of this article emphasized the three main factors which give flexibility to barrel finishing operations: the type of media, the condition of the media, and the barrel compound.

This installment deals with some general aspects of barrel finishing practices and with the general treatment of metals, including the functions of cleaning and bright dipping.—*Ed.*

BARREL finishing in many cases is an economical method for obtaining a finish on metals which is just slightly inferior to the more costly wheel methods. In order to determine whether it is mechanically and economically feasible to do barrel finishing, the following factors must be carefully evaluated:

1. What type of finish is desired, and can it be obtained in a barrel?
2. Is enough work going to be processed to warrant the expense of installing a barrel finishing unit?

The type of finish obtained in a barrel differs from that obtained by either a grease belt or a buffing wheel. It is never claimed that barrel finishing will replace buffing, since it is both impossible to avoid a very slight peening effect and to localize the action to one area of the work in a barrel. The peening occurs especially on flat surfaces, making them the most difficult to barrel finish, with most of the factors in opposition to the operator. The flat areas will take the full force of another part moving toward it, whereas a round surface may cause the "blow" to glance off. Furthermore, a flat surface will show every small imperfection, since no natural optical distortion is provided. A round piece, even if it is peened severely, will often look better than a flat surface which may not have been peened nearly as much.

This makes small round parts the most ideally suited ones for barrel finishing. Fortunately, these are often the same shapes which are most difficult to hold during a buffing operation. Furthermore, it is obvious that a much larger quantity of small parts may be handled by a barrel at one time. In these respects, the two methods, barrel finishing and belt or wheel finishing, supplement each other very well.

Since barrel finishing is almost always much more economical than buffing, the difference in the quality of the finish obtained between barrel rolling and buffing is occasionally not large enough to warrant the additional cost of the latter method. Occasionally, however, a desired finish just cannot be obtained by a barrel finishing operation.

If the desired finish cannot be obtained in the barrel, the possibility exists that wheel finishing may be combined with barrel finishing. In many cases, the work must be cut or deburred before coloring. It may be more economical to do the first operation by rolling, with the coloring done on a wheel. On occasions this process may just be reversed. Very heavy burrs or flash may be ground off with a belt and the work then barrel finished.

Setting Up a Barrel Finishing Plant

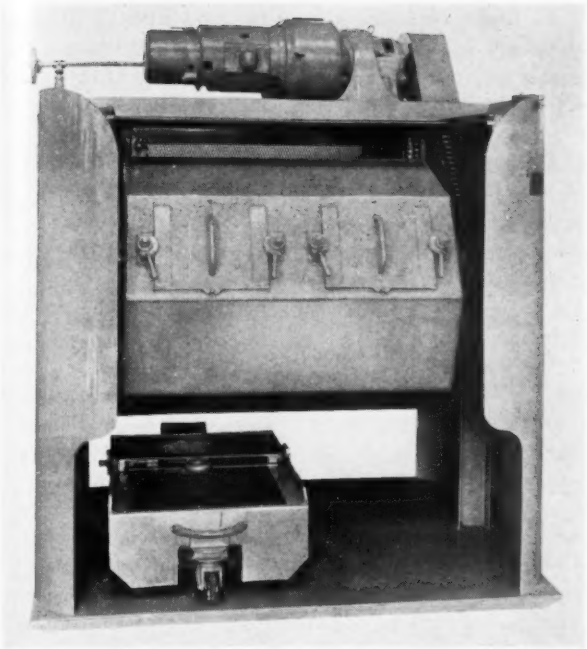
Barrel finishing, like any mass production operation, becomes more economical when larger quantities are processed. The greatest saving is in labor, and may be achieved through extensive standardization of procedure. There are two principle ways of setting up for barrel finishing. The first way exists where just one or two barrels will be required in the plant to supplement other finishing equpiment, if and when needed. The second type of installation is one where the main emphasis is on barrel work. This type may be found in larger job shops specializing in barrel finishing, or more often in the finishing department of manufacturing concerns that make articles composed of many small parts which lend themselves readily to barrel finishing techniques. The second type of installation is much more economical to operate due to three main factors:

1. The same type of work is constantly produced so that the cycles may be standardized.
2. Since nearly the same quantity of parts are regularly processed, a schedule may be worked out so that all barrels are given the maximum use with minimum of down-time.
3. The same parts-handling equipment may be used for many barrels, thereby lowering the cost.

There is now available from a large number of suppliers a great variety of barrel finishing equipment. This variety exists both in the barrels and in auxiliary equipment.

In Figure 1 a modern finishing barrel is shown. This type unit incorporates features such as magnetic brakes, start-stop-reversing switches, variable speed controls, and different types of linings for specific purposes. Barrels may be obtained in many sizes from one quart in capacity to large, four-compartment 36" diameter units. The handling equipment available includes all types of hoists, hoist pans, screen and magnetic separators, centrifugal and rotary parts driers, etc.

Modern equipment of this type permits the personnel operating the installation to accomplish the most work at the lowest labor cost.



(photograph courtesy Crown Rheostat and Supply Co.)

Figure 1. **This photograph shows one of the many modern finishing barrels and accompanying hoist pans now available to the industry. This is one of the large production units featuring two compartments and a variable speed drive.**

Space for efficiently handling the work is a very necessary item for successful and economical barrel finishing. In order to have the type of installation that permits the greatest degree of flexibility and handles the greatest variety of work, more than just a barrel or two is called for. The old idea of a "burnishing barrel" off in the corner has no place in the modern concept of production barrel finishing. The layout must be just as carefully planned as when erecting an automatic plating unit. Pre-cleaning, rinsing, bright-dipping, separating work from media, screening media for size control, storage of media, drying and possible oiling of parts, must all be co-ordinated and space must be allocated for these operations.

The labor cost in the particular locality is one of the deciding factors as to whether barrel finishing is more economical than buffing. In areas where semi-skilled and skilled labor may be obtained at relatively low rates, buffing may be almost as economical as barrel finishing, especially on larger parts. If this labor cost is high, however, barrel-type processing becomes more feasible, even for larger parts. One man can handle a large number of barrels, and can do the work of many buffers. In a fairly good size installation, a well trained crew of operators can accomplish amazing cost reductions. Good team-work on the part of the personnel in the charging and discharging of the barrels can cut costs even from an already low-cost barrel finishing operation. When a battery of barrels is employed, there is no reason why more than one or two barrels should be open and idle at any one time (except for lack of work), as the rolling time of the cutting down barrels can be co-ordinated with the burnishing barrels.

The more barrel finishing work done by a particular department, the lower will be the cost per piece. In addition to the barrel or barrels themselves, a large part of the initial cost is in handling equipment. Such items as magnetic and screen separators, hoists, storage bins for the media, plumbing, the media itself, handling buggies, pre-cleaning tanks, rinse tanks, water-displacing protective oil tanks, parts driers and sawdust barrels are all needed whether one or several finishing barrels are employed. By efficient planning one set of auxiliary equipment can be made to serve a very large number of barrels.

General Treatment of Metals

Before considering the barrel finishing of a particular metal, it must first be decided whether the prime objective is to obtain luster on the highlights, a uniform surface and luster, the formation of a particular dimension or radii, the removal of burrs and casting flash, or a combination of all four. To produce a brilliant luster, burnishing is almost always required. It is quite possible to burnish a piece to a mirror finish and yet leave all burrs and casting flash intact. This is frequently done on low priced sand-cast parts. In other cases, all traces of surface irregularities must be removed prior to burnishing.

Cleaning

As was mentioned previously, good cleaning is essential in order to obtain satisfactory barrel finishing results. In the vast majority of the cases, alkaline cleaning is most suitable. The alkaline cleaning materials generally provide the most rapid cleaning at the lowest cost, and provide for free rinsing.

The alkaline soak cleaning solutions range in concentration from 2-10 ounces per gallon and temperatures from 160 to 212°F. The exact nature of the cleaner depends to a large degree upon the metal being processed and on the soils being removed. Specific recommendations are best made right on the job by the representative of the firm producing the cleaning materials. The work is generally handled in baskets.

Self-emulsifying Solvent Cleaning

Occasionally, it becomes impossible to employ a hot soak-type cleaner, and yet light drawing or protective oils must be removed. Under such conditions, the use of an emulsifiable solvent type cleaner is recommended. The work is immersed in these cold cleaners and then given one, or preferably two rinses. Since this type of material is fairly free rinsing, and the little that is not removed by the rinses is in the barrel in an emulsified state, they generally do not interfere with the operation.

Barrel Cleaning

When neither the alkaline soak cleaning nor the solvent emulsion cleaning are feasable, the work may be cleaned in the barrel itself. In larger installations it is a good idea to set aside one barrel just for this purpose if no tanks are available. Barrel cleaning consists of rolling the work for from 5-30 minutes in a hot solution of a special cleaning compound. (This is preferably done with the media removed from the barrel. With their many fine pores, the stones are much more subject to contamination by oils and greases than either the work or the barrel.) These cleaning compounds are thoroughly flushed from the

barrel and either discarded or saved in a storage tank and heated for re-use.

When necessary, the barrel cleaning compound may be followed in the barrel by an acidic descaling compound. Providing that the work is not excessively soiled to start, special types of acidic descaling compounds containing synthetic detergents and wetting agents may be employed to simultaneously barrel clean and descale the work.

BARREL CLEANING WITH THE FINISHING COMPOUND

Some of the alkaline, non-soap base barrel finishing compounds, with or without synthetic wetting agents, have a higher tolerance for oils, and can, under extenuating circumstances, be used to serve a double role as both cleaner and barrel finishing compound.

These last three methods are not generally recommended, but are included in this article because they are employed in a large number of installations where the more generally accepted soak type alkaline cleaning is not suited for some reason peculiar to the individual set-up.

Bright Dipping

The function of a bright-dip prior to barrel finishing is to expose a new fresh surface, preferably slightly matte in nature, which may subsequently be rolled out by burnishing. Since ball burnishing does not remove any metal but rolls out very minute irregularities, faster and better results may be obtained if the gross surface irregularities are chemically removed by etching just before burnishing. This effect is especially noticeable on the softer metals such as the copper alloys and aluminum. The chemical smoothing action of the bright-dip reduces the gross surface irregularities to a series of very microscopic ridges and valleys. These may then be rolled level by ball burnishing without the actual removal of metal. Thus a surface is produced which is in a smoother condition than had the work not been matte dipped. See Figure 2.

The chromic acid bright dip on copper alloys, for instance, smoothes the surface and simultaneously improves the color, thereby making the burnishing results much more satisfactory. This minute etching or smoothing action of the bright-dip has been employed advantageously for many years by some operators who considered the color improvement the main function of the bright-dip.

The color of a metal can not be improved by the mechanical action of burnishing. If a metal surface is tarnished or otherwise corroded, and, since by burnishing this surface is not removed, the color of the metal can not be improved. Therefore, it becomes essential that all corrosion products be removed and that a fresh surface be brought out prior to burnishing. This new surface shows the true color of the metal. (Specific bright dips will be given for the individual metals in the third part of this article.)

The concept that the color can not be improved by burnishing cannot be carried over to barrel finishing in general. When a tarnished surface is removed with an abrasive media, a new, fresh surface is produced just as is done by bright dipping. If there are areas which can not be reached by the media, however, bright dipping is required.

To follow this idea a little further; when it is found necessary to bright dip a piece of work because the media will not reach all the recesses, and if this same article requires deburring before burnishing, it is often best to do the bright dipping after the deburring and directly before the burnishing. This is a modification of the cycles which call for cleaning, bright dipping, deburring and burnishing in that order, and provides the work with the best possible surface condition directly before the final operation of burnishing.

Discoloration Due to Media Breakdown

The soft metals, brass, aluminum, zinc, etc. are subject to discoloration in a barrel, especially when long rolling times are employed, not so much by the breakdown of the finishing compound and subsequent attack on the metal, but by the very fine particles of worn-off media that become imbedded in the metal surfaces. When this occurs, the work looks as though it had been attacked by the solution. The way to overcome this is to change the solution as soon as the build-up of broken down media becomes excessive.

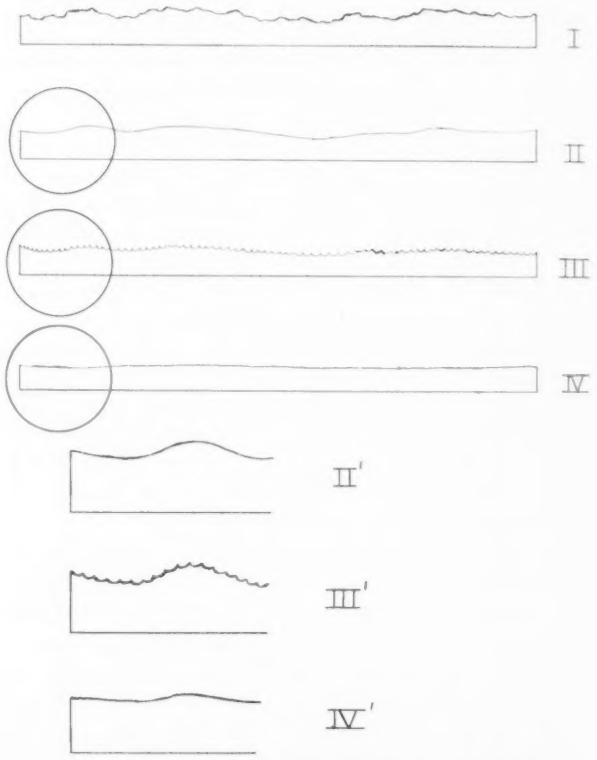


Figure 2. This illustrates in an enlarged manner the mechanism by which bright dipping or etching combined with burnishing produces a smooth finish. This combination is especially effective on the soft metals such as copper alloys and aluminum. Smoothing is effected in less time when the burnishing media acts on the slightly matte surface produced by bright dipping, than when the same media acts on the relatively gross surface irregularities not removed by cutting down (or from work which was not cut down).

(I) cross section showing the surface as received by the finishing department.

(II) cross section showing the result of cutting down. Note that a better micro-inch finish has been obtained with the removal of the large surface irregularities.

(III) cross section showing that as a result of bright dipping, the remaining gross surface irregularities have been reduced to a large number of very minute irregularities.

(IV) cross section showing that the minute irregularities produced by bright dipping have been rolled out by burnishing. Although no metal was removed in the burnishing, a better finish may be produced when the etched surface is rolled out than had the surface shown in (II) been burnished directly.

It is in this respect that the main advantage of the submerged type of barrel is found. With its larger quantity of solution and the possibility for the breakdown products to settle to the bottom of the tank, much longer runs may be obtained in the submerged barrel before the solution becomes contaminated with finely divided media dust.

The media dust that becomes imbedded in the metals is much finer than the added abrasive powders or the abrasive compounds referred to in a previous section. Because of this larger size, there is little danger of the abrasive powder particles imbedding themselves in the work.

The solid matter is generally not imbedded very deeply. Once it has taken place there are two very simple ways of removing it. The first method consists simply of flushing out the barrel and recharging with fresh solution and rolling for a short time. This method works best when the work is so shaped that all parts of it are in contact with the media.

The second method is to bright dip or etch the work. Even a very minute etch will remove that thin surface layer of metal in which the solid material is lodged. This is another reason for bright dipping after the cutting down portion of the cycle whenever possible. If work is to be bright dipped anyhow, any length of cutting down time may be employed without too much concern being given to the color of the work as it immerges from the cutting barrel.

This, however, should not be interpreted that the writer advocates haphazard operation at any time. Good practice demands that the broken-down media be flushed from the barrel when it becomes excessive for the reason that it slows down the cutting action.

General Cycle for Barrel Finishing

The general cycle for a barrel finishing operation including cleaning and bright dipping is as follows:

1. alkaline soak clean
2. cold running rinse
3. cut-down or de-burr if necessary
4. cold running rinse
*5. short dip in alkaline soak cleaner if a soap-base barrel finishing compound was employed in step 3 and if the parts are to be bright dipped or acid pickled
6. cold running rinse
7. bright dip or acid pickle if necessary
8. cold running rinse
9. burnish
10. lukewarm rinse if possible, otherwise cold running rinse (preliminary rinse in barrel may be substituted for this step)
11. hot rinse to facilitate drying
12. dry.

**This alkaline dip will remove the slight quantity of soap film, which is left on the work by all soap-base barrel finishing compounds, and will make the bright dipping more uniform.*

The above cycle is, of course, a general one from which certain steps may be eliminated to suit specific situations.

Bright dipping, for instance, may be entirely unnecessary, eliminating steps 5, 6, 7, 8 from the cycle.

Work such as castings is often received in a sufficiently clean condition to make pre-cleaning unnecessary. In such cases, steps 1, 2 are not required. (This may be in addition to the elimination of the bright dipping steps.)

When water-displacing protective oils are used to both dry and impart protection to steel parts, steps 11, 12 are omitted.

Some work requires only ball burnishing to obtain the desired finish, whereas other work needs only cutting down or deburring.

From these few examples, the reader can see how this general cycle may be varied to provide the desired results at a minimum cost. More specific variations of this cycle will be considered in the next installment.

(*To be continued*)

CONVENTION PAPERS

(*Concluded from page 69*)

Some Practical Considerations of Current Distribution

By *Ralph A. Schaefer and Harry Pochapsky, Cleveland Graphite Bronze Company, Cleveland, Ohio.*

In electroplating operations the control of current distribution is very important in that it is only through such control that deposits of uniform thickness can be obtained on contour work and that minimum-thickness specifications can be met without depositing excessively thick metal on some parts of the work.

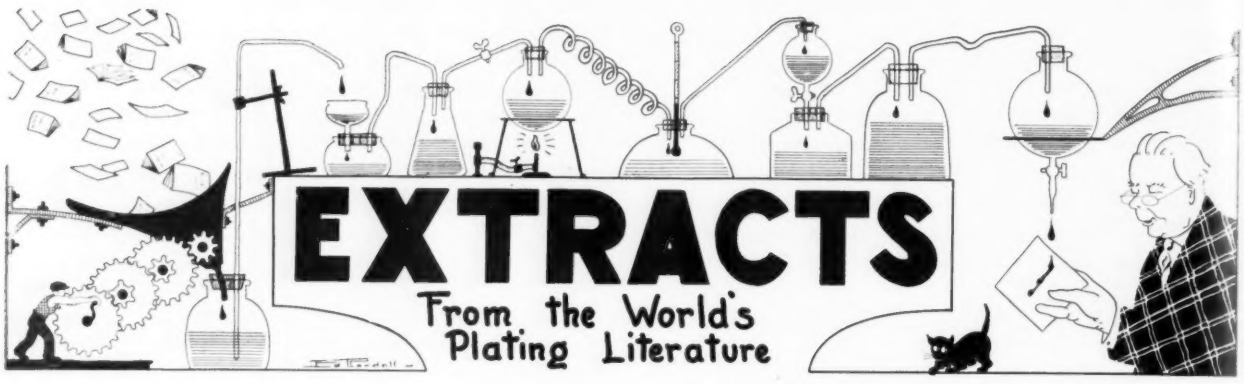
The variables which are of most importance in current-distribution problems are throwing power and the multitudinous physical, chemical and electrical variables which enter into the plating operation.

Throwing power has not been well defined mathematically, but qualitative values obtained by the method of *Haring* and *Blum* are useful as guides. It is found that all commercial baths may be classified into one of four groups, thereby indicating the extent of current distribution problems which are likely to arise.

The geometries of the individual anodes and cathodes, as well as their geometrical relationship to each other and the tank, are important physical variables. Several typical examples are discussed. Bipolar electrodes may be used to advantage in some cases to alter radically the normal current distribution. Agitation markedly affects current distribution by decreasing polarization, but normal temperature variations have little effect.

Among the chemical variables, increasing the bath concentration enhances throwing power, high pH is normally more desirable than low pH, and impurities and addition agents may either increase or decrease throwing power. These generalizations should be used only as guides, and it is necessary to investigate a particular bath very carefully to determine the exact effect of the chemical variables.

Current density, current efficiency and conductivity of the bath are the most important electrical variables. In general, metal distribution is more uniform at lower current densities. When current efficiency decreases with increasing current density, the throwing power of the bath is improved. The conductivity of the bath normally has but little effect.



Spotting-out on Electroplated Noble Metal Deposits

W. Burkart: *Metalloberflaeche*, vol. 3, No. 5, pp. B65-B66.

The author discusses the causes and prevention of spotting-out defects on noble metal platings, principally silver plate. These spots can be of various sizes and appear after some 3 to 14 days after plating and even later than this. The trouble takes the appearance of a core surrounded with a halo which grows larger after a certain time and then remains permanent. These spots which have a matte-white appearance can be easily removed mechanically by rubbing with a cloth. As present day practice with silver plating is not to store the plated ware but to despatch almost immediately after plating, the appearance of these spots will occur only when the ware is in the warehouse or shop or even has reached the customer, and although it is easily removed, leads to considerable dissatisfaction.

Investigation has shown that these spots are not caused by the polishing paste used. The porosity of the base metal was then examined as a possible cause. Rolled sheet which is greatly used for the ware on which the spots appear, frequently shows small pores. Although these are microscopically small pores they can feasibly be a source of trouble by trapping bath solutions which react with the undercoat and silver plate. A micro-photograph is shown of such spots which have been caused by a pore in the base metal.

The best way to remove this trouble caused by pores in the base metal was found to be by the employment of hot rinse water and prolonging the rinsing time from ½ to ¾ of an hour. Even after several hours rinsing however it was found that the greatest number of the spots could not be prevented.

Further investigation served to show that a great number, probably even the greater number of the spots were caused by pores in the silver plate deposited. These pores are extremely fine and it is difficult even to see them under the microscope. It was established that atmospheric oxygen gradually penetrates the silver plate by way of these pores and under certain circumstances reacts with the underlying material and causes the spotting-out trouble. In all cases where the trouble was encountered the underlying material was either brass or nickel silver. When atmospheric oxygen penetrates through the pores of the plated metal, it reacts with the alloying zinc of the base metal as a result of strong local cell formation, the non-noble base metal serving as the solution electrode. Even with extremely fine pores in the plated silver, one can reckon on strong corrosion under the plate without the silver coating being affected. The zinc oxide formed creeps into the pore and under favorable conditions around the edge of this on the silver plate. The zinc oxide formation will now continue and the size of the spot will increase until the zinc oxide formation has ceased i.e. until all the available zinc in the vicinity has been converted. It is clearly a case of simultaneous local cell formation and corrosion.

Two fundamental ways are possible to prevent the formation of these spots. The porosity or freedom from porosity of a plated coating practically entirely depends on the surface properties of the base metal. Thus it is an absolute necessity to prevent this trouble, to plate on a highly polished base metal surface. In addition the removal of microscopically fine pores from the base metal surface by the polishing will prevent any retention of bath liquids and so a further possible cause of trouble is simultaneously prevented. Precautions must be taken also to remove suspended impurities in the bath and inclusions in the base metal which can also cause porosity in the silver plate. A second way of preventing spot formation is by increasing the thickness of the silver plate. Increase of the thickness from 10 to 20 μ to a thickness of 40 μ will prevent these spots but of course this course is a question of cost and commercial considerations.

Electrochemical Cleaning of Large Metal Surfaces

Landsmaschine (Russia): Reported in *Metalloberflaeche*, vol. 4, No. 9, p. B. 133.

Scale and grease coatings hinder the contact welding of steel and metal surfaces so that considerable variations in the tensile strength of the welded parts occur. It is a very difficult task practically to clean large metal surfaces. Accordingly, in the Electric Welding Laboratories of the *Agricultural Machinery Ministry of Soviet Russia* a process was developed for the electrochemical cleaning of large metal surfaces.

Mechanically driven steel wire brushes are connected

electrically with the secondary winding of a transformer, while the other end of the winding is connected with the metal work table on which the part is placed. The metal part to be cleaned is then placed on the work table and assurance of electrical contact is made. The rapid revolving of the wire brushes causes small electric arcs between the moving wire ends and the metal surfaces by a wear sparking effect and this serves to burn off the scale and dirt surface. The following wire brush ends remove these small particles, so that the metal surface becomes metallically clean.

In the test installation used to develop this process, the wire brushes were diven by a 2 h.p. motor at 2,800 r.p.m. The wire brush is electrically insulated from the motor shaft. The current is passed by means of a copper ring and stiff carbon brushes. A flexible rope holds the installation which is held in equilibrium so that the steel brushes can freely glide over the metal surface. The transformer used is operated at a voltage of 380 volts and provides a current strength of 60 to 100 amps. Tests showed that the untreated plates showed a tensile strength after welding varying from 100 to 390 kg./sq. mm. while the mechanically cleaned plates has tensile strengths varying from 220 to 360 kg./sq. mm. On the average a 10% higher increase in the tensile strength is obtained.

Simple Test to Control Properties of a Surface Prepared for Plating

J. Liger: *Galvano* (Paris), vol. 19, No. 162, pp. 9-10.

To obtain a perfectly adherent electroplate on a metal surface, the surface to be covered must be free from all trace of grease, oxide or other foreign substances. The author in 1947 recommended the use of a solution of copper sulphate for testing the clean qualities of a ferrous surface, and this method was proposed by *Hogaboom* in 1948 before the *American Electroplaters Society*. Some further notes on this subject are added by the author in the present notice. If the steel surface has been perfectly cleaned, on immersion in the copper sulphate solution, a perfectly uniform copper deposit is obtained. The presence of any colloidal substance originating from the degreasing solutions leads to an imperfect deposit of copper. The author states that he agrees with all the findings given by Hogaboom regarding this test. A solution of the acidity proposed does not appear suitable for detecting the presence of very thin films of oxide because this can activate the surface. It would then appear preferable to use a solution of a pH between 3 and 4. But the acid solution will be suitable in the majority of cases.

This test accordingly is capable of showing whether a steel surface has been suitably cleaned and degreased and whether it is free from all film capable of adversely affecting the quality and adherence of the deposit. If on immersion the copper deposit is clear and of uniform aspect, the surface preparation has been satisfactory; if on the contrary, the deposit forms very slowly or if it is dark in color and covered with spots or has a marbled effect, then the surface preparation has been faulty.

Spotting-out Trouble with Plated Deposits

W. Burkart: *Metalloberflaeche*, vol. 4, No. 9, pp. B134-B135.

Discoloration or spotting out trouble generally shows itself as a white effect, sometimes as a large surface area discoloration and sometimes as small spots.

A factor which should be taken into consideration in considering this trouble is the quality of the polishing paste used during and after the plating respectively. Buffing as compared with grinding or polishing is purely a plastic deformation process to obtain a plane surface, and no material is removed if the process is conducted properly. With polishing there is very little possibility of the polishing paste being incorporated in the deposit, but in buffing, where projections are pressed over into the cavities to give an even surface, there is a distinct danger that the polishing paste can be occluded in the plated deposit (or the base metal) in this manner. It has been shown that the polishing pastes are significant to the formation of spotting-out faults. Bonding agents used in the paste will be variously of neutral and acid fats, or if a synthetic material can show an alkaline reaction. The polishing powder will generally be of a neutral nature, but some powders suitable for polishing show an acid pH.

According to the composition of the polishing pastes, these will show a pH below or above 7. While this alkalinity or acidity respectively of the polishing pastes plays little or no role when polishing the noble metals, it has a certain significance when polishing the non-noble metals such as nickel, copper, brass, aluminum, etc. It has been shown that these metals which are treated with pastes which deviate to a certain extent from the neutral point (pH = 7) can give rise to spotting-out trouble.

Investigation has demonstrated that when this pH value lies above 11 to 11.5 or below 5, this spotting-out can occur. Employment of polishing pastes with a pH value of 7 have never been found to give rise to the trouble. In the case of fatty-bound polishing pastes it may be difficult to ascertain the hydrogen ion concentration value, but the acid or alkaline number may be used.

Porosity of Plated Deposits

R. Erdmann: *Metalloberflaeche*, vol. 4, No. 9, pp. B. 138-B. 140.

Thin deposits are naturally porous, but here the pores are not so outstandingly recognizable and only serve to reduce the protective effect of the plate. With increasing thickness of the deposit these pores can be closed so that the protective effect not only increases directly with the thickness but will even increase to a greater degree. Many types of pores can, however, increase in diameter with increasing thickness of deposit.

The most obvious cause of porosity in the plate is the nature of the base metal. Cast metals are generally porous to start with. Copper will cover these pores by virtue of its "creeping" effect sideways, and buffing will tend to press the soft copper into the pores.

Rolled material does not have the large pores of cast metal, but the pores here are particularly dangerous because not so much attention is paid to them. Slag and other inclusions in the base metal are a much more disturbing influence. Some of these inclusions can be dissolved out by the pickling bath and can then leave coarse, dangerous or at least very troublesome pores. They can also react with the bath solution and locally hinder the deposit or give rise to local porous or spongy deposits. They can lead to the objectionable hydrogen pitting, because the hydrogen bubbles preferably adhere to such places. These pores can be of considerable size; for example, with nickel plating they have been observed of a 1 mm. (.040") diameter. Scratches, craters and all similar surface irregularities favor this adherence of the hydrogen gas bubbles and consequently the pore formation.

Microscopic cracks can also be bared by working of the metal, such as bending, drawing, pressing. Pores which have been closed over by an intermediate deposit can be opened up again by buffing and polishing to give subsequent trouble with the top plate. Also small and ordinarily non-dangerous pores can be filled with polishing paste to give trouble later on with the top plating.

Pores can also arise from particles in suspension in the bath. Anode slime needs attention and can be controlled by anode bagging and bath filtration.

The most troublesome bath impurities leading to pore formation and pitting in the deposit, are colloidal substances formed during the working of the bath. These will be hydroxides or basic salts, and in nickel baths particularly, colloidal iron hydroxide. Colloidal mould growth in the bath can also originate from wooden tank walls, from unsuitable tank linings and lacquers, polishing fats, and the decomposition of bath brighteners. These colloidal and organic impurities frequently cannot be removed by simple filtration, and colloidal ferrohydroxide must be first oxidized to ferric hydroxide. Pits, which are shallow pores which do not pierce the deposit, are particularly prone to occur in nickel baths and are due to a combination of basic salt formation, to which nickel baths are susceptible in the vicinity of the discharge film at the cathode, together with surface irregularities. These two factors give rise to an excessive localized hydrogen discharge and hydrogen bubble adherence with pitting trouble as the result.

The viscosity of the bath solution also has a certain influence on pore formation. Larger hydrogen gas bubbles are observed in acid baths than in alakline baths.

Chemical and Electrochemical Sharpening of Used Files

A. Pollack: *Metallaberflaeche*, vol. 4, No. 12, pp. B 179-B 180.

The chemical or electrochemical sharpening of old files is a problem which comes up periodically. Recutting of the files is lengthy and troublesome and is not a practical commercial proposition. Of all the methods proposed up to now the author has not found any of the proposed methods which has been good enough to be adopted in extensive commercial use. Previous methods proposed have been an immersion treatment in acids and an anodic treatment in dilute sulphuric acid. Both of these processes were tested in a detailed series of tests.

Summing up the results of this work, it can be stated that the chemical and electrochemical processes for the sharpening of old files proposed in the literature and examined by the author were not found to fulfill the great claims which have been made for them. A certain sharpening effect is obtained, but a true sharpening does not occur, as the points of the file teeth do not become sharper, so that the cutting action of new or mechanically sharpened files cannot be achieved. A completely worn out file cannot be put back into service by any of these means.

Some Special Problems of Plating Temperatures in Chrome Plating

H. W. Dettner: *Metalloberflaeche;* vol. 4, No. 12, pp. B. 181-182.

Decorative chrome plating presents a special problem in bath temperature control. As is common knowledge, the deposition of bright chrome deposits occurs within a certain range of bath temperatures and current densities. The necessity for obtaining bright chrome deposits becomes pressing when plating recessed objects which are difficult to polish. The deeper portions of the recessed parts render it difficult to maintain for a given bath temperature the requisite current density to ensure a bright deposit at these parts and to avoid a milky chrome plate. In such cases, one must work as far as possible in the middle of the bright chrome range. The widest bright chrome range is obtained at a temperature of 25° C. with a chromic acid content of 300-400 grms./litre. This CrO_3 content is the one generally used for decorative bright chrome, with a current density of about 10 amps./sq. dm., (93 a.s.f.) but the bath temperature is generally maintained at 35°-45° C. obtain the most favorable working conditions.

The color of the chromium plate is considerably influenced by the bath temperature employed. With low bath temperatures the chromium deposited has a blue color and at higher temperatures the chromium plate has more of a silver-white color.

Hard chrome plating is another specialized case; the current density will generally be 50 amps./sq. dm. (465 a.s.f.) with a 250 grms./litre CrO_3 bath and the bath temperature 50-55° C. The throwing power of a hard chrome bath at this temperature is inferior to that of a decorative chrome bath operated at a lower temperature. The hardness of the chrome plate is also affected by the bath temperature. The hardest chrome plate is not attained at the temperature mentioned above but when the hard chrome bath is operated at 40°C., with lower current density. The wear resistance of hard chromium plate is also affected by the bath temperature employed. Hard chromium plate with the highest wear resistance characteristics is obtained with a bath temperature of 55°C. as well as with a current density of 15 and also 120 amp./sq. dm. The coatings with the highest corrosion resistance are obtained with the low current densities and high bath temperatures.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Silver Plating Inside Tubes

Question: In silver plating to a thickness of .0003" on the inside of rectangular brass tubes 1½" x ⅜" inside dimensions, we find that we do not get a good plate way down inside. We are using silver rod anodes which reach almost to the bottom of the piece. Do you think an insoluble anode would help any? If not we would appreciate any other suggestions you could make to help us overcome this problem.

L. G.

Answer: An insoluble anode would not be of any advantage over the silver rod. What is probably happening in this case is that the solution is becoming depleted in soluble silver ions way down inside the tube, so that plating ceases in that area. You can overcome this by pumping the solution down inside the tubes to replenish the silver content of the solution in that area. It is also necessary to use much higher current densities than normal, as what you have in effect is a strike bath which is high in cyanide and low in metal ions. In order to avoid excessive build-up and waste of silver on the outside of the tubes while plating the .0003" on the inside, it may be necessary to stop off the outer surfaces for at least part of the plating cycle.

Throwing Power in Bright Barrel Zinc Plating

Question: We are having difficulty in bright barrel zinc plating parts with deep recesses and outside threads. In order to get sufficient zinc in the recessed areas to meet a 100 hour Salt Spray specification we have to overplate the threaded areas. In some of the recesses we can never seem to get sufficient plate.

We are operating our zinc bath at 85°F. and a total cyanide-zinc ratio of 2.8. Could we expect better results with a higher ratio of cyanide to zinc, or would the higher cyanide content cause the already plated zinc to be stripped off during a no-contact period in the rotation of the load?

S. J. W.

Answer: A higher cyanide-zinc ratio would no doubt tend to give more uniform deposits, but would also reduce the cathode efficiency and thus require longer plating periods for the same total thickness of deposit. There is also some possibility of chemical solution of the zinc in high cyanide baths, but this could be minimized by keeping the barrel load as small as practical so that all areas are exposed to the current and breaking of contact held to a minimum.

Poor Adhesion in Silver Plating

Question: We are silver plating nickel silver tubing, about 1 inch long, and are finding that after "tubbing" the silver plate to brighten it the plating peels off. Can you give us any reason why this should happen?

K. B.

Answer: Your problem definitely reflects poor adhesion of the silver deposit to the nickel-silver tubing. This usually points to poor cleaning or insufficient or improper use of the preliminary strike treatment. Avoid prolonged reverse current cleaning, and use a strike in a low-silver high-cyanide strike bath prior to plating.

Using Boric Acid in Chrome Baths

Question: Can you give us any information on the use of boric acid in chrome plating baths? We have heard that it promotes throwing power into recesses, especially on zinc die-castings. Would this also hold true for plating chrome on nickel plate or over copper alloys?

S. D. A.

Answer: The only important reference that we have been able to find on the use of boric acid in chrome plating baths is the patent (U. S. 1,903,130) issued to *Mr. Wm. Phillips,* of General Motors Corp. This patent was issued on March 28, 1933 and has now expired. To the best of our knowledge boric acid has not been used commercially.

Corrosion of Aluminum Brush Holders

Question: We have a problem with the aluminum brush holders on our motor generators, in that they are developing a white corrosion product which prevents the brushes from sliding freely on the commutator. Can you give us any suggestions as to what may be causing this salt build-up and how to eliminate it?

N. S. J.

Answer: It is difficult to explain why the corrosion occurs, but it must be due to some special condition not ordinarily encountered or described. However, a suggestion would be to use some kind of a passivating dip on these parts. If an insulating film can be tolerated on such parts you could also anodize the aluminum parts, which would help to prevent this type of corrosion.

Spot-Free Drying of Small Parts

Question: We are sending you some samples of small copper parts that we wish to dry after bright dipping without leaving any water spots and without using sawdust, which gets inside the parts and causes cleaning prob-

lems. Can you give us any suggestions?

S. G. H.

Answer: Several methods are possible. The first would be to give the parts a final rinse in distilled or demineralized water, followed by drying on a steam table or in a warm air centrifuge. A second suggestion, if the expense is warranted, would be to dip the parts in pure denatured alcohol as a final rinse, followed by drying as above. Another method would be to dip the parts in an emulsifiable solvent cleaner to rinse off the water, followed by degreasing and drying in a vapor degreasing machine. Any of these methods should give spot-free drying in this case.

Emulsion Cleaner Terminology

Question: We have been confused by the terms "emulsifiable cleaner" and "emulsion cleaner," which are apparently not one and the same thing. Can you tell us what difference, if any, there may be?

J. J. L.

Answer: Emulsifiable solvent cleaners are used in concentrated form, and can be completely rinsed off in water. They are especially useful as soak cleaners to loosen hardened buffing compounds, etc., in place of vapor degreasing.

Emulsion cleaners usually are made up of an *emulsifiable* cleaner dispersed in a water solution, usually in the range of 1 part of emulsifiable cleaner to 5-10 parts of water. Emulsion cleaners can also be rinsed off in water, and are widely used in power spray washing machines for general cleaning operations where the soil is fairly easy to remove. They have a dual solvent effect on both organic and inorganic soils. Practically speaking, the principle difference is in whether they are used in concentrated form or mixed with water to form an emulsion.

Re-Claiming Chromic Acid from Rinse Waters

Question: We are very interested in methods available for re-claiming the chromic acid in the rinse water from our chrome plating operations, also in the processing of sea water for use in plating solutions. Any information you could give us would be helpful.

L. G. L.

Answer: In regard to recovery of chromic acid from rinse waters, the most common method is to have a still re-claim rinse tank after the chrome tank, using the re-claim water to add to the plating bath for make-up. It is possible to re-claim the chromic acid by a process of concentration by distillation, provided that chromic acid is the only material in the water. This method of course requires quite an installation of equipment, and unless there was a lot of chromic acid involved would probably be prohibitive in cost. Under separate cover we are sending you the names of firms who can furnish the necessary equipment.

In order to process sea water for use in plating baths it is necessary to distill the water. The cost is high, and the most suitable process at present would be by the use of compression distillation equipment, which seems to offer the cheapest process for converting large quantities of water. Tear sheets of an article describing the compression distillation process are being forwarded.

WANTED

Firms to do Plating and Coating of Coiled Stock

Metal Finishing's office is often contacted by persons wishing to locate firms who are equipped to finish coiled strip and wire, both for electroplated and organic finishes. Any firms interested are requested to get in touch with us. Your name will be kept on file and passed along whenever this type of inquiry comes up again. It would help if some idea can be given of the size range that can be handled, and what types of finishes can be produced in your plant. Send this information to *Editor, Metal Finishing, 11 W. 42 St., N. Y. 18, N. Y.*

PATENTS

Recently Granted Patents
in the Metal Finishing Field

24 Hour Patent Service

Copies of these or any other Patent will be mailed within 24 hours of receipt of order and payment of 50 cents per Patent. Give Number, Title, or general subject matter. PATENT PROCUREMENT SERVICE, BOX 4127MF, Washington 15, D. C.

Water-Displacing Composition

U. S. Patent 2,545,137. *W. David, assignor to Shell Development Co.*

A composition for displacing moisture from and preventing corrosion of metals having the following formula and proportions:

	PER CENT BY WEIGHT
Light petroleum hydrocarbons boiling between about 50 to to 370°C.	78
Blown rape oil	7.5
Petrolatum	7.5
Na salt of sulfonic acid derived by direct sulfonation of a petroleum fraction containing at least 5% aromatics	2.0
Diacetone alcohol	5.0

Water-Displacing Liquid

U. S. Patent 2,545,138. *W. David, assignor to Shell Development Co.*

A corrosion- and rust-inhibiting lubricating composition adapted to displace moisture from metal surfaces prior to being metal worked and prevent corrosion, said composition having the following formula and proportions:

	PER CENT BY WEIGHT
Mineral lubricating oil	85 to 95
Sodium salt of petroleum naphthasulfonic acid derived from a petroleum naphtha containing from 5 to 10% aromatics	2 to 5
Blown rape oil	3 to 5
Methyl cyclohexanol	5 to 10

Tumbling Compound

U. S. Patent 2,545,291. *J. Lupo.*

In a polishing compound for processing articles, a fibrous carrier of generally rounded formation having projections extending outwardly from one portion thereof, and an abrasive bonded to the surface of the carrier by an adhesive and lubricating vehicle including lanolin, glycerin and kerosene of normally solid consistency and which liquefies under the heat generated in the processing of the articles.

Chrome Plating Large Cylinders

U. S. Patent 2,545,294. *W. Messinger and D. B. Lytle, said Lytle assignor to Time, Inc.*

A tank for plating elongated cylinders comprising an elongated vertically disposed tank structure for containing an electrolyte and an elongated cylinder, a vertically disposed bay extending outwardly of and opening into the tank at one side thereof, an anode in the bay, means for adjusting the position of the anode in the bay, a door between the bay and the tank, a well in the bottom of the tank, a plate mounted for rotation in the well, and a bearing mounted on the plate for eccentric rotation with reference to the plate and for receiving one end of an elongated cylinder, the door being supported for rotation about a vertical axis to vary the effective width of the entrance into the bay during a plating operation and thereby control the current density under varying conditions of temperature in the electrolyte, the plate in the well being rotatable to adjust the distance between the anode and the cylinder to be plated, and the cylinder supporting bearing being rotatable relative to the plate for rotating the cylinder within the tank during the plating operation.

Lead Plating Bath

U. S. Patent 2,545,566. *J. M. Pooe, assignor to P. R. Mallory & Co., Inc.*

The method of electrodepositing lead from an aqueous alkaline bath containing soluble lead salts which comprises employing a lead anode having an effective surface area less than 0.5 the surface area of the cathode to be plated and passing an electric current therethrough at an anode current density of about 30 to about 50 amperes per square foot of effective anode surface area, said current density being less than that required to polarize said anode and greater than that at whch anode current density increases substantially proportional to the increase in impressed voltage.

Vacuum Metallizing Process

U. S. Patent 2,545,576. *P. Godley, 2nd, assignor to National Research Corp.*

Apparatus for applying an electrically-conductive metal film to a sheet dielectric material which comprises an enclosed chamber adapted to be maintained under a pressure below about 1 mm. of mercury, means for supplying metal vapor to the sheet material, a variable-speed drive for moving a web of said sheet material through said chamber with a surface thereof exposed to said metal vapor whereby a film of metal is deposited on said surface of a thickness inversely proportional to the speed of said web, a pair of electrical contacts within said chamber engaging the metal film on said traveling web at points spaced a constant distance apart on the surface of said metal film, a source of electrical potential connected across said contacts to cause current to flow through said constant length of film at a rate proportional to its thickness, and means for varying the speed of said variable-speed drive with variations in said current whereby to maintain the thickness of the metal film substantially uniform.

Improving Adhesion of Tungsten Alloy Deposits

U. S. Patent 2,546,150. *A. Brenner, P. S. Burkhead and G. E. Riddell, assignors to the United States of America.*

The method of improving the adhesion to a cobalt base of an electro-

lytically codeposited alloy of tungsten and a metal of the group consisting of iron, nickel and cobalt, which method comprises the steps of making the cobalt base an electrode in an electrolytic bath from which one of said tungsten alloys can be plated upon said base and passing alternating current at a current density of from about 0.25 to 1 ampere per square decimeter through said bath and through said base for from about five seconds to several minutes immediately prior to codepositing the alloy from said bath upon said base by passage of direct current through the bath and through the base.

Manganese Plating Bath

U. S. Patent 2,546,547. *J. Koster, assignor to Crimora Research and Development Corp.*

The process of electro-depositing substantially pure, gamma manganese in a single compartment cell having an insoluble anode and employing an electrolyte which consists of about 40 grams of manganese per liter and about 165 grams of ammonium sulphate per liter, wherein about 6.7 grams of boric acid per liter are added to the electrolyte, and wherein the electrolyte is circulated continuously through the cell, which comprises adding finely divided electrolytic manganese to the spent circulating electrolyte in sufficient amount to maintain the manganese content of the electrolyte in the cell substantially constant during the electrolysis; and maintaining the pH of the electrolyte in the cell approximately neutral.

Electropolishing Machine

U. S. Patent 2,546,920. *C. Cupps, assignor to Standard Steel Spring Co.*

In electroplating and electropolishing apparatus, a substantially vertically extending support for an article, said support being connected in an electric circuit, a supporting arm connected at its inner end to said support and having at its outer end a locating pin adapted to be received in a hole formed in the article, an electrical contact connected to said support below said supporting arm and contacting the article over an area at least several times greater than the area of contact between the article and said locating pin, a spring connected to said support and extending below said electrical contact, and a hook connecting said spring and article for holding the article tightly against said electrical contact, said hook having a body portion passing through an opening in the article, an enlarged head for retaining the hook in place, and a curved portion for removable engagement with said spring.

Clear Chromate Dip for Zinc

U. S. Patent 2,548,419. *A. E. Chester and D. F. Seymour, assignors to Poor & Co.*

A method of producing lustrous zinc surfaces and of protecting zinc surfaces against corrosion, which comprises treating a zinc-surfaced article with a chromic acid solution capable of forming a stain thereon and then with an alkaline reducing solution of a hydrosulfite.

Sealed Chromate Dip for Zinc

U. S. Patent 2,548,420. *A. E. Chester and B. Leonelli, assignors to Poor & Co.*

The process of producing a zinc surfaced article resistant to corrosion which comprises immersing the article in a bath containing chromic acid, rinsing the article, and before the rinsed article is dry immersing it in an alkaline silicate bath containing 1 ounce to 12 ounces per gallon of sodium silicate at a temperature within the range of 120 degrees F. to 180 degrees F.

Hot Dip Galvanizing Method

U. S. Patent 2,546,451. *M. C. King, assignor to United States Steel Co.*

A method of producing a galvanized ferrous metal body by immersing said body in a bath of molten zinc comprising passing said body through a bath of palm oil and then into and through a molten zinc bath, said palm oil bath being disposed a substantial distance above the molten zinc bath, said palm oil bath being connected to the zinc bath by a narrow spout-like column of palm oil extending downwardly from said palm oil bath onto said molten zinc bath, the thickness of said column being very little in excess of the thickness of the article passed therethrough.

Buff Design

U. S. Patent 2,548,623. *C. F. Schlegel, assignor to The Schlegel Mfg. Co.*

A buffing wheel having a body formed of a plurality of superimposed layers of fabric material of arcuate shape with substantially concentric arcuate warp strands and with substantially radial weft strands of a series of different lengths, each weft strand of a length shorter than the longest lying in juxtaposition to another weft strand of the same length on one side and a weft strand of a longer length on the other side.

Portable Pickling Machine

U. S. Patent 2,548,793. *R. C. Hopkins.*

A portable pickling machine comprising a combined supporting frame and bail, a rectangular bucket journalled in the frame in such position that when the frame rests upon a horizontal surface the bucket may be freely rotated in the frame above said horizontal surface, a ratchet wheel fixed to the bucket, a lever fulcrumed upon the frame, and a pawl upon the lever engaging the ratchet wheel for rotating the bucket.

Descaling Silver-Copper Alloys

U. S. Patent 2,549,137. *A. F. Slover, assignor to Kelite Products, Inc.*

A process of treating alloys of silver and copper for the removal of copper oxides, which process consists in treating the alloy with a hot solution of an acid reacting aluminum salt of a strong inorganic acid.

Anodic Stripping of Nickel from Steel

U. S. Patent 2,549,411. *H. M. Bell and E. W. Schweikher.*

In the stripping of nickel from ferrous metals, the process which comprises inserting a ferrous metal article coated with nickel in a stripping bath and passing a direct current from said article, serving as anode, to a cathode; said stripping bath consisting substantially of an aqueous solution of a salt whose anion is that of an oxidizing-passivating acid selected from a class consisting of nitric and chromic acids and whose action is that of a nitrogen base selected from a class consisting of ammonium hydroxide, guanidine, diethanolamine, triethanolamine, trimethyl amine, ethylene diamine, urea, benzyl amine, aniline, methylphenyl amine, dimethylphenyl amine and diphenylmethyl amine, said bath having a concentration of said salt ranging from about 50 to 300 grams per liter and a pH within the range of from about 3.0 to 6.0.

(*Continued on page* 96)

Engineering Information Useful In
Designating Metallic Surface Treatments

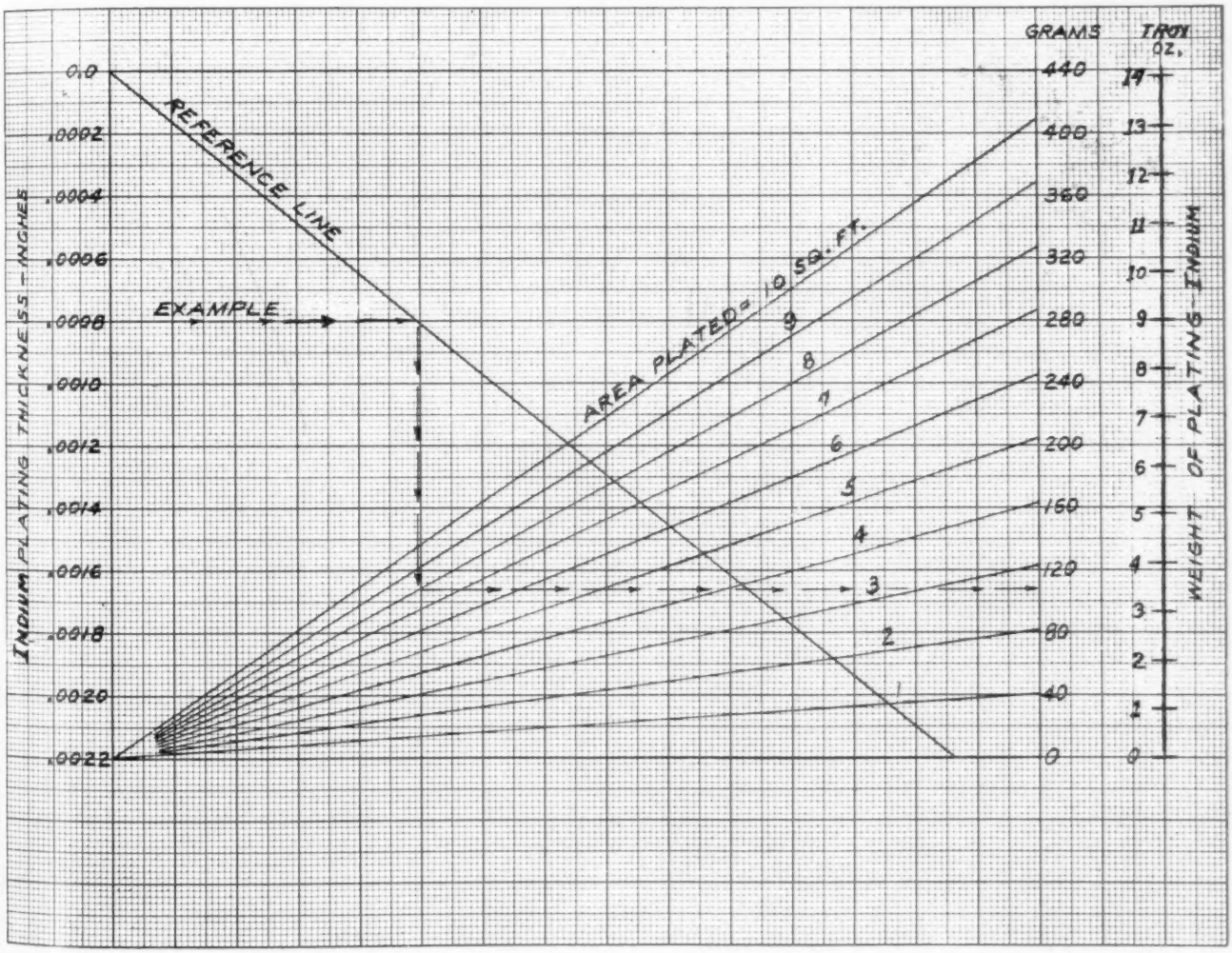
Engineering Data Sheet

Calculating Metal Cost in Indium Plating

With the aid of the chart below, the metal cost for indium plating to a specified thickness on any known area can be calculated. The example shown is for a deposit .0008" thick on an area of 8 square feet. Metal weight in right hand column is in Troy Ounces.

The following factors can be used to convert from weight of metal to various indium salts:

Metal weight × 1.93 wt. of Indium Chloride — $InCl_3$
Metal weight × 2.97 wt. of Indium Sulfate — $In(SO_4)_3$
Metal weight × 1.68 wt. of Indium Cyanide — $In(CN)_3$

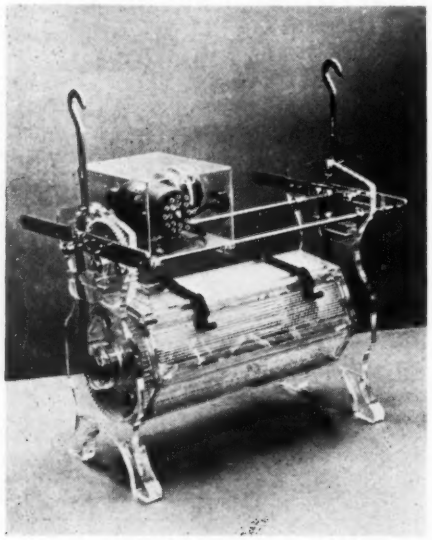


Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Portable Plating Barrel With Plexiglas Cylinder

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.



A new development of the above firm is the Mercil portable-type plating apparatus with Plexiglas cylinder. This equipment, which is made with cylinders 6" in diameter x 12" long O.D. and 8" in diameter x 18" long will enable the user to process small parts efficiently.

The entire unit is light in weight and can be easily handled. A rheostat is included so that the cylinder can be operated at various speeds. Cylinder, legs and gears are of Plexiglas; the motor is 1/15 H.P., suitable for operation on 110 or 220 volt, single phase, 60 cycle power circuit. It can be used in either acid or alkaline solutions, providing the temperature of the bath does not exceed 180-185°F.

This type of equipment is particularly adapted to the processing of small parts.

New Bright Copper Process

Lea Mfg. Co., Dept. MF, Cherry Ave., Waterbury, Conn.

The Lea Copper-Glo process is claimed to make it practicable to plate pre-finished steel and die-castings directly with chromium (over the bright copper) without any intermediate buffing operation.

The Ronal high-speed bright copper plating process, using Lea Copper-Glo, is an improved method for depositing a mirror-bright copper even at high current densities and at 100% efficiency with exceptional throwing power, it is claimed. Deposits obtained from this bath are claimed to be comparable to bright nickel in brightness and are said to be an ideal coating for zinc die-castings prior to nickel, brass or chromium plating. The deposit is ductile, bright for all thicknesses of plate, and has excellent adhesion to the base metal, according to the firm. On steel, where it may be desired to flow the deposited copper to remove or hide scratches or polishing marks, the Ronal bright copper is an ideal coating.

The Ronal bright copper solution will deposit mirror bright deposits at a current density range of 10 to 60 amperes per square foot, with standard cathode rod agitation. Operating temperature range is broad, from 140 to 160°F. Lea Copper-Glo is stable. No breakdown of the brightener occurs even if the plating solution should stand idle for prolonged periods, it is claimed.

New Phosphate Process

Octagon Process, Inc., Dept. MF, 15 Bank St., Staten Island, N. Y.

Moving parts made of iron and steel can get two-fold protection with a chemical treatment announced by the above firm. Known as "Rustshield 2," it is a phosphatizing compound which changes steel and iron surfaces to rustproof, highly absorbent nonmetallic areas. Such a steel surface, with vastly increased surface area, is an ideal base for the retention of lubricating oils.

Rustshield 2 is usually applied to rubbing and sliding surfaces of precision parts such as thrust washers, pump pistons, gears, valve roller pins, stems and guides, as well as bearing surfaces of every type. Although parts treated in this manner are corrosion resistant, the degree of such resistance can be increased by finishing with a drying oil or wax such as yellow beeswax; the retentive qualities of this type of phosphate coating are thus utilized.

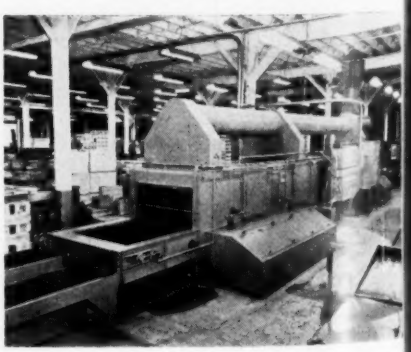
Close tolerances are not affected by the phosphate treatment. The oil-retentive qualities of a treated metal surface are due to the "hills and valleys" formed during the process; however, these depressions are microscopically small, and are so numerous that the uniform nature of the surface remains unchanged. Thus, metallic parts with precise dimensional tolerances can be Rustshielded without fear of ruining many hours of costly machining time, it is claimed.

Rustshielding is a simple, inexpensive immersion process which consists of precleaning with vapor degreaser, safety solvent, or an alkali cleaner especially designed for cleaning prior to phosphating (such as Octagon 400). Cleaning is followed by rinsing, Rustshielding, rinsing, and final treatment with a passivating agent, such as Neutralyte solution. The Rustshield liquid is applied by hot immersion, and outside of a stainless steel tank, requires no special equipment.

Rust-Proofing Machine

Industrial Washing Machine Corp., Dept. MF, Rust-proofing Div., New Brunswick, N. J.

Currently in use at a prominent government installation, this machine features an unusually high capacity of 500 square feet of conveyor space per hour. The machine first sprays work



with a rust preventative, the built-in, explosion-proof infra red oven quickly dries it, and then the work is cooled to permit immediate handling. Additional safety features include an automatic CO_2 system and fully electrical operating controls. The continuous conveyor is kept free, clear and clean of residue by a special rotating brush and a detergent spray. This self-cleaning feature eliminates the need to stop the machine and interrupt production to clean the conveyor. The machine offers the extra advantage of rust-proofing versatility because it is adaptable for vari-shaped-and-sized work.

High-Speed Semi-Automatic Metallizing Guns

Metallizing Engineering Company, Inc., Dept. MF, 38-14 30th St., Long Island City 1, N. Y.

Two new metallizing guns have recently been announced by the above firm. The new guns, the Metco Type 4E for machine element work, and the Type 5E for corrosion protection coatings, are said to develop the highest spraying speeds yet available in guns designed for hand-held operation. At the same time, the new guns provide the nearest thing to automatic operation yet devised, since they incorporate a patented jet-siphon principle in the gas head which automatically compensates for variations in gas pressure as high as 10 lbs., and is said to provide a steady, unvarying flame which produces uniform coatings at lower cost than previously possible. The new guns also incorporate automatic control of wire feed which compensates for kinks in the wire, reel stand drag, etc. The Metco Type 4E Gun is claimed to spray all wires from 20 B&S gauge to 1/8" in any metal—

carbon steels, stainless, Monels, bronze —at speeds up to 40% faster than previous models and is expected to cut machine part repair and salvage costs as much as 85% to 90%. The Type 5E is said to be the first gun specifically designed for high-speed spraying of the softer metals, such as zinc and aluminum, for protection of equipment and structures against corrosion. The 5E Gun sprays 3/16" wire and will deposit as much as 55 lbs of zinc per hour, aluminum 15 lbs. per hour. The guns may be mounted for use on a lathe or other machine in production line work, or may be used in hand-held operation, since they weigh only 4 lbs., 12 oz.

Light-Duty Polishing Machine

Lewis Roe Mfg. Co., Dept. MF, 1042 DeKalb Ave., Brooklyn, N. Y.

The polishing machine illustrated was designed for light buffing and coloring work to take the place of heavier machines. The machine is driven by a ¼" H.P. alternating or direct current motor mounted on the stand.

The machine is equipped with two self-aligning ball bearing pillow blocks and has a ¾" diameter spindle 22" long. Longer spindles can be furnished if required. The spindles are turned down at the ends to ½" diameter and threaded eight square threads to the

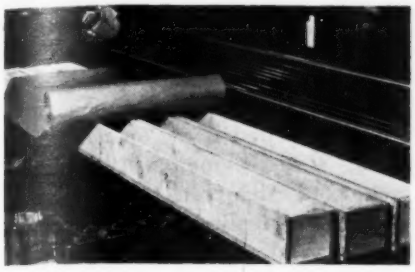
inch. The spindle is tapped for taper points which are furnished with machine.

A switch, eight feet of cord, a V-belt and a device for keeping belt at a uni-

form tension are also furnished. Machine weighs approximately one hundred pounds and can be moved about the shop.

Rust-Preventive Wrapper for Heavy Products

Nox-Rust Chemical Corp., Dept. MF, 2429 S. Halsted St., Chicago 8, Ill.



Development of a new heavy-duty packaging paper, treated with a volatile-type rust inhibitor, is announced by the above firm.

The new product was developed for protection of heavy machinery and bulky metal parts during storage and shipping. It is made for Nox-Rust by Glas-Kraft, Inc., Lonsdale, R. I., a leading manufacturer of high-strength industrial paper products.

The paper, called Vapor Wrapper, is tough, resilient, and tear-resistant. It is made of two high-strength kraft sheets, cemented together, and reinforced with spun glass fibers.

Identified as Nox-Rust No. 120 Glas-Kraft grade, it is one of a series of papers the company produces. The inner ply of kraft paper is impregnated with Callex, a volatile rust-inhibitor chemical. When a metal product is wrapped or shrouded with the wrapper, a vapor is released which prevents rust from forming. This product is also moisture and water repellent.

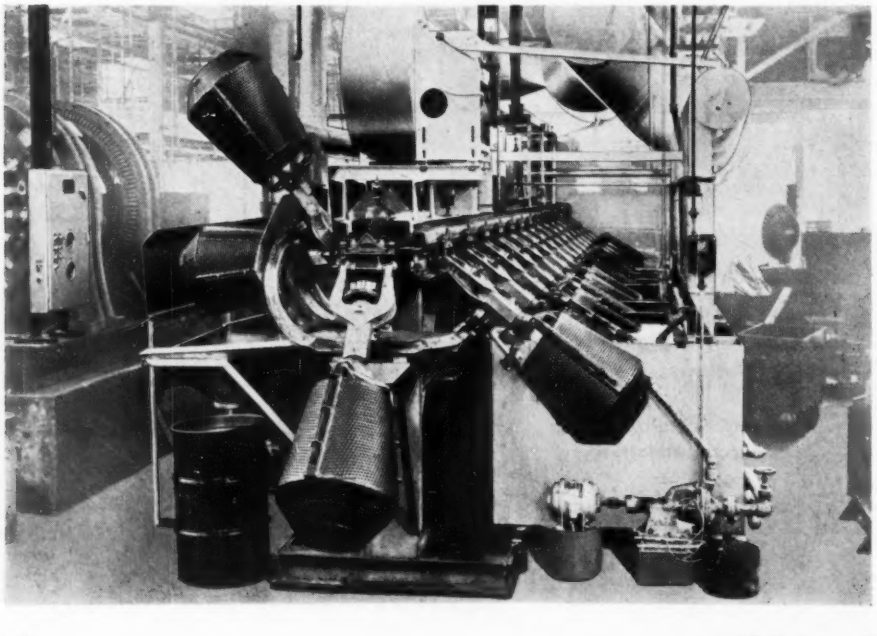
Full Automatic Barrel Plating Machine

F. B. Stevens, Inc., Dept. MF, 1800-18th St., Detroit 16, Mich.

Development of a new full automatic barrel plating and processing machine, the Stevens Super "E", was announced recently by this firm.

The new machine is a larger version of the famed Stevens Model "C" Machine, which until the advent of the Super "E" was claimed to be the only automatic barrel in the industry.

The Super "E"" was developed primarily as a supplement to the Model "C" machine in installations where requirements call for plating and pro-



cessing, in large volume with maximum economy, bulky metal parts not normally handled by the Model "C".

Basically, the Super "E" is a continuous rotating barrel-type machine. Barrels revolve continuously through the entire cleaning, plating, rinsing and drying cycle. Barrels are much larger, however, in the new machine than those of the Stevens Model "C" units.

Operation of the new machine is entirely automatic. The only manual process required is the loading of the barrels at the beginning of the plating cycle and this can be eliminated through the application of a mechanical loader offered by Stevens as auxiliary equipment. Because of the nature of the machine, it fits in ideally in modern materials handling installations where mechanical conveyors move work pieces through the plant.

The Stevens unit can be installed as an integral part of the materials handling system and thus eliminate virtually all labor, other than supervision and maintenance of plating baths, from the processing or metal finishing of work parts.

The new Super "E" is not a standard-sized unit. Models can be ordered in any size within practical economic limits. One of the new machines will be on exhibit at the National Metal Congress and Convention in Detroit, October 15 through 19.

Acid-Proof Pipe Joint

Electro Chemical Engineering & Mfg. Co., Dept. MF, 750 Broad St., Emmaus, Pa.

The above firm announces the development of a new type wrapped joint for Haveg and other resin-base pipe, known as the Duro-Joint. The Duro-Joint is composed of a spiral wrapping of glass cloth and Lecite acid and alkali-proof furan resin cement, using a special technique, and is said to be equal in strength and chemical resistance to the pipe itself. The Duro-Joint replaces in many instances the flange-type joint which is subject to corrosion, and also may be used to repair broken pipe or to armor porcelain or stoneware.

The Duro-Joint can be made in the field without the use of heat or special equipment. Duro-Joints were tested without failure under hydro-static pressure pulsating rapidly from 0 to 350 lbs./sq. inch. The joints were

then placed under 100 lbs. steam pressure and while hot, the pressure was released and the joint immersed at once in water at 60°F. The joints were said to be unaffected by this shock treatment. While under 350 lbs. sq. inch pressure, the joints were subjected to repeated blows of 8 foot pounds. At the conclusion of the above tests. Duro-Joints are said to have showed no leakage or damage. Further details may be obtained by writing.

Protective Hand Cream

Ottawa Eng. & Sales Co., Dept. MF, 14164 Ironwood Drive, Marne, Mich.

This firm announces the manufacture and marketing of Craftsmen hand cream—a unique product in the field of barrier creams.

Craftsmen hand cream, when applied to the skin prior to handling grease, oil, paint, lacquer, varnish, printers ink and the like, is claimed to allow any of these materials to be easily removed by merely rinsing the skin in water. No gritty soaps or harsh solvents are required. The cream works into the skin rapidly and leaves no annoying residue or sticky film on the hands, it is claimed.

Craftsmen Hand Cream is packaged in 8 oz. jars, one and five gallon cans and in fifty-five gallon drums.

Complete information and descriptive literature are available from the manufacturer on request.

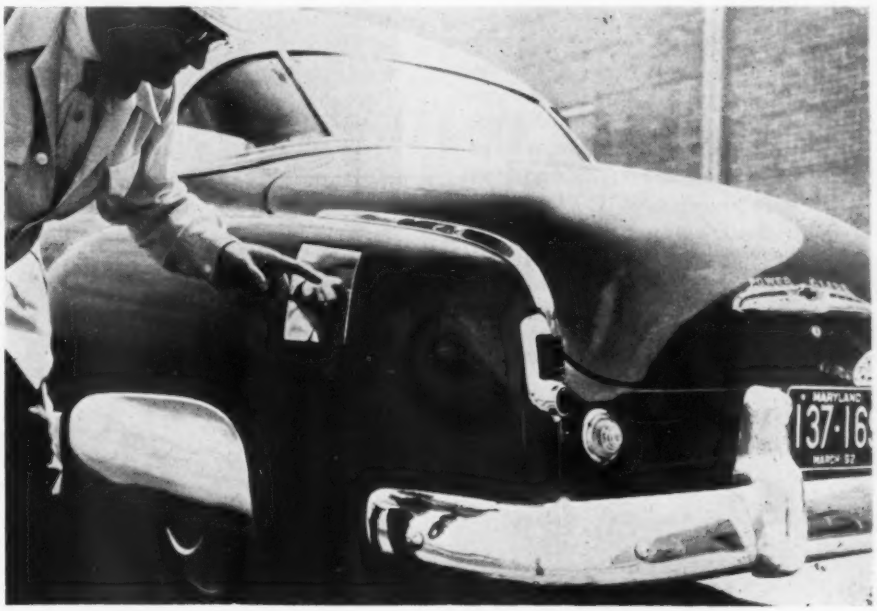
Chromate-Treated Zinc Plate Undergoes Performance Test

Allied Research Products, Inc., Dept. MF, 4004 E. Monument St., Baltimore 5, Md.

An alternate finish for chrome plate is still bright and clean after 10,000 miles, according to *H. C. Irvin*, president of the above firm, shown here inspecting the Iridite treated parts of the Allied Research Test Car.

The test is being conducted to determine the performance of an experimental zinc plate and Iridite finishing system as an alternate to conventional chrome plating for automotive hardware and brightwork. The 10,000 mile route covered the nation and passed through many severe types of weather and terrain, including industrial areas, dirt roads, alkali deserts and the East and West Coast salt atmospheres.

Parts under test include the front and rear bumper guards, gas tank flap, fender skirts, door handles, heat-



er duct and others. These were specifically chosen to provide comparative results from both interior and exterior hardware and trim located at various points on the car. Some of the parts are steel base metal, while others are zinc die-cast base metal. All are finished with zinc plate, Iridite, and either air-dried or baked clear lacquer. Iridite is a well-known chromate type conversion coating manufactured by Allied Research, sponsors of the test. It provides excellent corrosion protection and paint adherence to zinc, cadmium or aluminum surfaces.

At the present status of this road test the Iridite finished parts are showing excellent condition compared to the chrome plated parts, thus far indicating the practicability of the new finishing system in terms of both appearance and corrosion protection.

All tested parts were exhibited at the recent convention of the American Electroplater's Society and evoked a great deal of interest, especially to those convention delegates from the Detroit automotive area.

Vapor-Tight Temperature Controller

Burling Instrument Co., Dept. MF, 5 Vose Ave., South Orange, N. J.

The above firm announces the development of their new Model V-1C Water, Vapor and Dust Tight Temperature Control. The base is cast aluminum, ribbed to save weight, and is tapped for ½" iron pipe size electrical conduit or pipe.

The V-1C is interchangeable with the other instrument heads and the cover is large enough so that the V-1C can be supplied for any temperature from minus 200 degrees F. to 1400 degrees F. with standard tubes, and up to 1600 to 1800 degrees F. with special tubes.

As usual, it will be supplied with positive snap action Micro Switches, either normally open, normally closed for single pole double throw. Manual reset switches are also available.

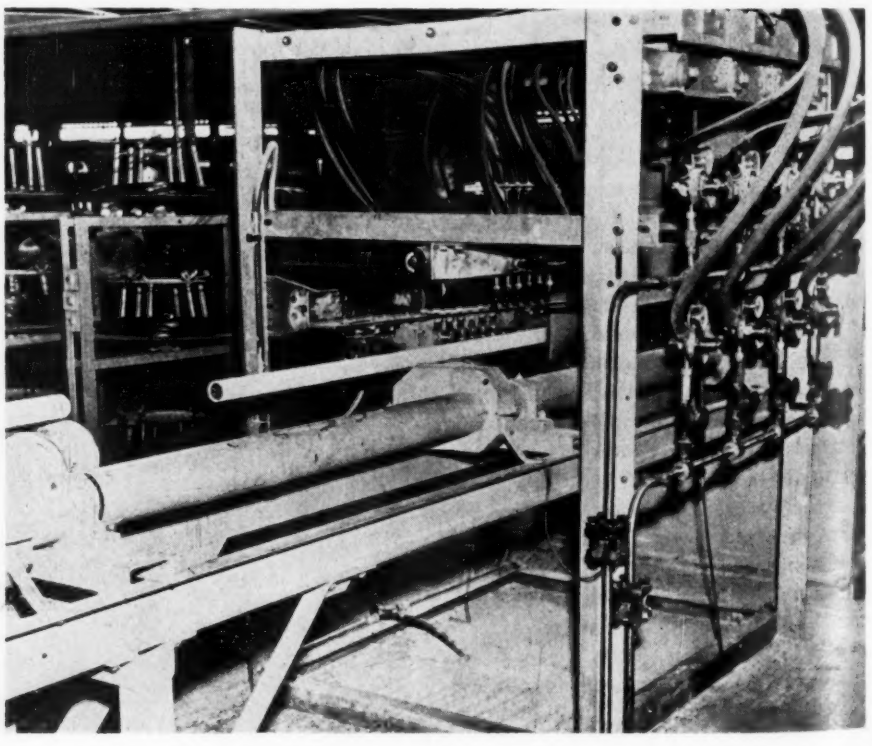
Illustrated literature on this and other Burling temperature controls is available on request.

Automatic Metallizing Equipment

Dix Engineering Co. Inc., Dept. MF, 1415-17 Dix Road, Lincoln Park (Detroit) 25, Mich.

Designed and built for specific production applications by Metallisation, Limited of Dudley, England, fully automatic metallizing equipment is now available in this country through the above company.

Illustrated above is a section of one of several automatic units in daily use on varying applications. In this case, 2" diameter scaffold pipe is being blasted and metallized with pure aluminum .004" thick at a speed of 1,200 lineal feet per hour. More than



forty feet long, this machine is so effectively controlled that only two men are needed for its efficient operation. Extremely low cost of operation results, in this instance, in a total cost (including labor, material and overhead) of less than ten cents per square foot for both blasting and metallizing, it is claimed.

All ferrous and non-ferrous metals produced in wire form can be applied by metallizing to a wide variety of products including all metals, glass, wood, paper, ceramics, carbon and many plastic base materials.

Interval Timers for 30 Ampere Load

Tork Clock Co., Inc., Dept. MF, Mount Vernon, N. Y.

This firm announces a revised line of Single-Set Tork timers for commercial and industrial service. These Timers may be had for either permanent installation or for portable use with cord and plug. Portable plug-in models are rated 6 amperes or 15 amperes. A single pole single throw normally open A.C. switch is timed and powered by a self-starting synchronous Telechron motor. Switches have heavy duty contacts of either 20 amperes or 30 amperes capacity. Compact in size, timers are enclosed in durable white or gray baked enamel cases, 4½ x 3 x 3". Smooth, hard finish is attractive and a snug fitting cover gives excellent dust protection. Timing interval is easily set by turning indicator knob on plainly marked dial. Various time cycles are available ranging from 60 minutes to 24 hours.

These heavy duty models provide selective switching where variable con-

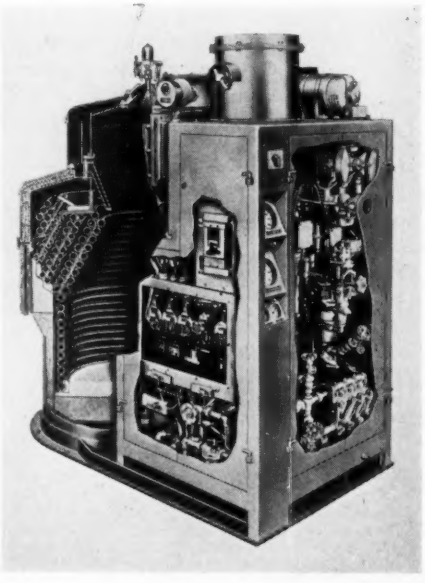
ditions make complete automatic control impractical. Additional features such as pilot lights, a signal circuit, by-pass switch, stop-switch and extra receptacles may be added if desired.

High-Pressure Dry Steam Generator

Vapor Heating Corp., Dept. MF, 4501 W. 16th St., Chicago, Ill.

This firm announces that this Vapor-Clarkson steam generator Model 4740, developed to supply large quantities of hi-pressure dry steam is now ready for industry to supply processing steam.

For size and weight this is claimed to be the most powerful steam generator developed by industry, develops



200 pounds steam pressure in two minutes from 50 degree cold water and produces 4800 pounds of 99% dry steam per hour, 82% efficient. Uses No. 2 fuel oil for fuel. One electric motor (or gasoline engine on portable units) drives the water pump, fuel pump, blower, and magneto. Once started, by turning one switch, automatic controls take over, causing the machine to turn on and off and produce steam only when steam is needed. Steam pressure may be changed from 70 to 600 p.s.i. by turning one control.

A servo control automatically modulates the machine to produce from one-third to full capacity. Many safety controls, such as steam temperature limit control, stack temperature cut-out, safety valves, electric flame control, time delay relays, and others have been incorporated into this machine. Constructed of the finest materials, in accordance with A.S.M.E. and Hartford specifications — overall size of this package unit is 52″ wide, 76″ long, 78″ high.

Electroplated Steel Wires Have Heavy Copper Coating

Kenmore Metals Corp., Dept MF, 380 Ninth St., Jersey City 2, N. J.

A new type of electroplated copper-on-steel wire which is suitable for a wide range of industrial, electrical and communications applications has been announced by the above firm.

The heavy electroplated copper coating is claimed to be perfectly and permanently bonded to a low, medium or high-carbon steel core wire for many applications, including plating rack springs, float racks and lift rods for plumbing products, power transmission, telephone and railway signal lines, lightning rods, television antennas and transmission lines, coaxial cables, heavy duty appliance cords; incandescent and fluorescent lamp leads, daubers, home appliances, radio tube leads, radio frequency coils, pigtail leads for capacitors and resistors, and many other industrial applications where stainless steel has been used because of its corrosion-resistant properties.

The new Kenmore "Copperon" wires provide electrical conductivity at high frequencies which is claimed to be comparable to that of solid copper wires, but they provide the advantage of increased dimensional stability, mechanical strength and light weight, which are important in conditions of vibra-

tion encountered in mobile, aircraft industrial and military electronic uses.

"Copperon" wires are produced by a patented, continuous electroplating process invented by *Herbert Kenmore*. "Copperon" wires should not be confused with ordinary copper plated wire; the coating on Copperon wires cannot be destroyed by changes in temperature, by pounding, by hot-rolling or cold drawing, it is claimed.

Relatively heavy cross-sections of the initial product are cold drawn to required diameters without change in the ratio of copper to steel or impairment of the bond between the two metals. Since the steel core is lighter than copper, "Copperon" wires provide about 10% more footage per pound than solid copper wires of the same outside diameter. They are available in practically any length and in diameters ranging from 3/8" diameter to the finest wire gauge sizes.

Non-Ferrous Bright Dip Meets Gov't. Specifications

Rossaul Co., Dept. MF, 170 Fifth Ave., New York 10, N. Y.

Copper-Brite, the above firm's bright dip for brass, copper, bronze, nickel silver, phosphor bronze, beryllium copper and most copper alloys—is now in accord with A/N, AF, ORD, and AEC specifications for bright dips on non-ferrous metals that require:

1. After clear water rinse, shall leave no residue that will interfere with conductivity.
2. Leaves non-ferrous metals in a passivated state, resistant to further oxidation.

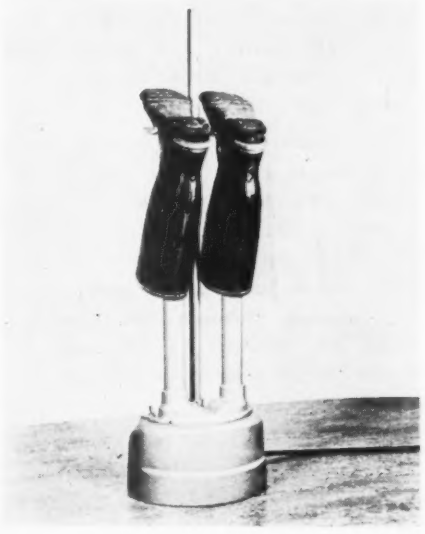
Completely safe to handle; special drains not required. The material is said to be non-toxic, non-fuming, requires no special ventilation, does not etch, will not discolor silver solder.

Machine Speeds Drying of Boots and Shoes

The Chicago Hardware Foundry Co., Dept. MF, 3501 Commonwealth Ave., North Chicago, Ill.

This firm announces development of a new Sani-Dri boot and shoe dryer. Developed to meet the need for a quick, economical method of drying boots and shoes, this machine has many uses in industries and municipalities.

Drying is accomplished quickly with a 125 cubic foot per minute air stream heated by a 13.5 amp. element with a 5300 BTU output. The boots



are placed on the boot bracket over the metal tubes, drying is finished quickly by the heated air blowing into the boots. Complete protection to the machine is provided by a sensitive circuit breaker to protect the heating element from excessive overloading.

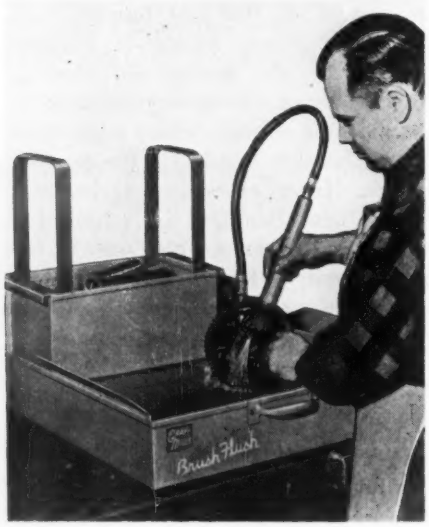
The new Sani-Dri is a portable model that operates either on AC or DC current. A toggle switch controls the machine, which comes equipped complete with drying tubes and adjustable boot bracket.

Bench-Type Parts Cleaner

Graymills Corp., Dept. MF, Evanston, Ill.

A new low-cost bench-type parts

cleaner, the Brush-Flush, with handy fountain brush action, has recently been developed by the above firm.



It features a hollow handle brush attached to the pump, to produce a steady flow of clear solvents at the end of the bristles. Oil, grease and dirt are flushed away as they are loosened with the brush.

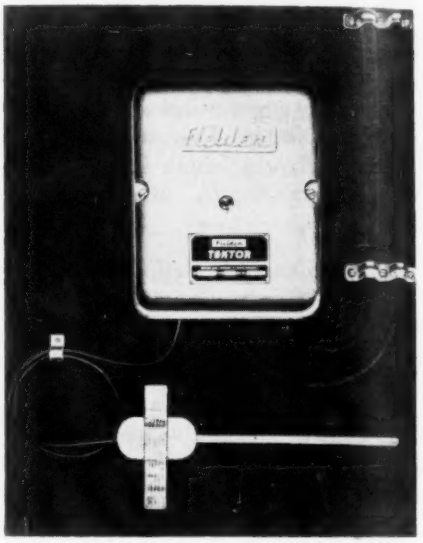
The cleaning solution flowing from the brush is always clear due to the double filtering arrangement. Parts are cleaned on the large screen platform. This "captures" dirt flushed off the parts. Small particles of grit, chips, etc., passing through the platform screen are retained by the baffle or second filter screen located at the pump intake.

A 2½-gallon soak tank with dip basket, independent of the main tank, can be used with either the same, or a different solution. The Brush-Flush is generally placed on the work bench and plugged into any 115 volt electric outlet. Nylon fountain brushes are offered by the manufacturer, who also produces a full line of Agitor parts cleaners and Agitene cleaning solvents. Literature is available.

Liquid Level Switch

Fielden Instrument Corp., Dept. MF, 2920 North Fourth St., Philadelphia 33, Pa.

This switch makes possible level control of practically all liquids and



solids. Liquids may be of high or low viscosity and may have electrical conducting or insulating properties.

No electrical contact is necessary with the material under control. The equipment does not rely on floats, diaphragms, or any moving mechanical parts, it is claimed.

Model AJ-1 Tektor is housed in a dust-tight, splash-proof die-cast aluminum box, 6½″ x 7½″ x 4″ deep, with screw-on cover.

The electrode, connected to the instrument through a two-foot length of cable, consists of a simple probe, 4″ to 6″ long, ¼″ to ⅜″ in diameter, which is inserted into the container at the level at which control is required.

A level differential of 1/32″ up to ⅜″ may be obtained. The probe may be insulated or not, depending on the application. For some applications the sensing element may be flush with the inner surface of the container.

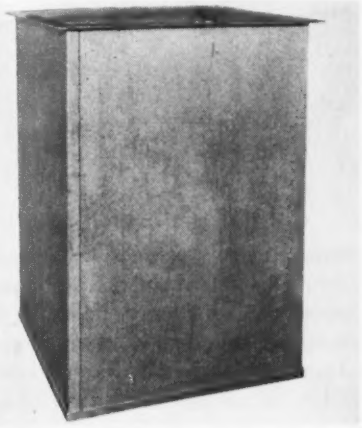
Other models of Tektor Level Switch apply to special conditions, such as frothing, and models that give upper and lower levels are higher priced.

Acid-Resistant Tank Material

The Van Dorn Iron Works Co., Dept. MF, 2685 E. 79th St., Cleveland, O.

This firm has established a Lucoflex Division that is producing many industrial products from this unusual material.

Lucoflex is a non-plasticized polyvinyl chloride, manufactured into rigid sheets, tubes, bar stock and molding powder, and capable of being welded, machined and formed. Lucoflex does not go through the phenomenon of aging, and is said to be resistant to almost all acids, alkalies and many special chemical solutions. Water vapors will not permeate the material. It is unaffected by temperatures between 177°F. and 50° below zero Fahrenheit. Structurally, Lucoflex is of interest to design engineers because its weight is only one-half that of aluminum with about the same tensile strength. No industrial finish for protection against precipitation and fumes is needed, as it is the same material throughout.



Exterior of a plating tank lined with Lucoflex to make it impervious to sulphuric acid.

Wet Blast Machine

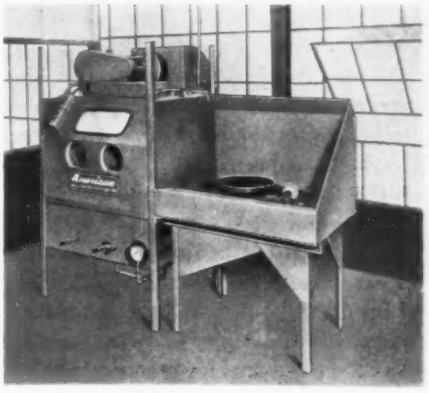
American Wheelabrator & Equipment Corp., Dept. MF, Mishawaka, Ind.

The introduction of a new wet blast machine with many special features for improved operation and reduced maintenance is announced by this firm.

The marketing of the new product is a step in conformity with the company's policy of providing all types of blast cleaning equipment.

Among the special features in the new wet blaster is a vertical pump for slurry recirculation. It is adaptable to rugged service, and because of its position, it is said to eliminate all suction piping, valves, fittings, and labor for removing them for inspection of the pump. It is always primed by flooded-type suction, and the operation of valves for starting or stopping is unnecessary. Loss of slurry through leakage is eliminated because there are no packing glands. Abrasive can't plug the pump impellor when the machine is shut down. Another important feature is that the hopper need not be drained before the pump is removed.

The machine has a conveniently low work ceiling, but the bottom of the machine is high enough off the floor to make good housekeeping possible. Rubber hose has been used instead of metal pipe wherever possible. Not only is this an advantage from a maintenance standpoint, but it eliminates noise from water hammer.



The armholes are equipped with gauntlets so that every workman can use his own gloves and small work can be passed through the armholes without opening the doors. Gauntlet drainage has been carefully designed so that there will be no slurry dripping down the front of the cabinet.

A reset timer is available on the Liquamatte which tells at a glance the number of blasting hours that the abrasive has been in the machine. It lets the operator know when to change abrasive and makes it easier for him to avoid wasting abrasive. When the abrasive does need changing, the operator doesn't need to bail out slurry or handle it in any way. An air ejector is available for blowing the slurry through a length of hose, either to a sump pit or to barrels.

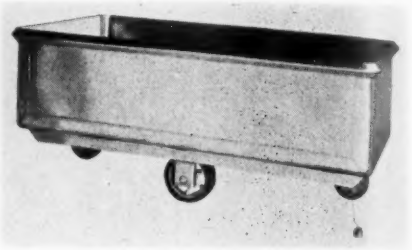
As a safety feature, the machine height is such that the average operator will be able to stand on the floor with no platform needed. A clear view of the work is easily available through the large vision window, and cool fluorescent lights do not cause abrasive to bake on the glass, thereby cutting out illumination.

The machine is intended to perform work for which dry blasting is too severe; namely, work with thin edges and sharp corners or work needing precision cleaning. All sorts of dies, bottle molds, rubber molds, etc. have been cleaned in the Liquamatte laboratory with success. The manufacturer is prepared to supply from stock all abrasives and chemicals needed in the equipment. Abrasive sizes stocked range from 80 to 2,500 mesh.

Sanitary, Stainless Steel Tub-Type Truck

Market Forge Co., Dept. MF, Everett, Mass.

Years of experience in the development of this type of equipment have gone into this special truck offered by the above firm. Its design is especially suited for the chemical industries.



Stainless steel throughout, the inside of the truck is carefully finished and polished to resist corrosion. All the corners are rounded so as to be easy-to-clean and always remain sanitary. The top edges are reinforced with a triangular piece of formed metal to stiffen the sides and resist damage. The removable plug (optional) in one corner allows the contents to be easily drained.

The truck is furnished with any type and arrangement of swivel or rigid casters. The structure on which it is mounted may be of stainless or structural steel galvanized or painted and can be attached permanently or as a removable unit. The bearings are equipped with thoroughly tested seals which prevent the entrance of dirt and foreign matter as well as the escape of grease.

Specifications are: Capacity—1,000 lbs.; Length inside—60″; Width inside — 26½″; Depth inside — 16½″. Wheels may be cushion rubber, hard rubber, aluminum, plastic or semi steel.

Flame-Sprayed Stop-Offs for Plating

American Agile Corp., Dept. MF, Plastics Div., 5806 Hough Ave., Cleveland 3, O.

A new and extremely economical method of masking portions of metal articles to be plated has been developed by the above firm.

Instead of covering the sections which are not to be plated by the con-

ventional methods, such as lacquering or tape masking, a completely nonporous and chemically inert coating of polyethylene (about 1/16" to 3/32" thick) is flame-sprayed onto the section to be masked. To allow the initial removal of the stop-off mask for reapplication to subsequent parts, the section to be masked is covered with a thin coating of a special mold-release agent prior to spraying.

Due to the inherent elasticity and chemical inertness of polyethylene, these stop-offs are removed from the plated parts and then replaced onto those to be plated a great number of times by simply snapping them off and on the part to be plated.

Flame-sprayed polyethylene stop-offs are said to result in enormous labor and material savings to the plater by eliminating the tedious and time-consuming operation of masking and unmasking each individual part.

The firm offers the flame spray equipment for making stop-offs by the individual plater as well as polyethylene plating stop-offs made to customer's specifications.

Reversible Plastic-Coated Gloves

Washington Glove Corp., Dept. MF, 106 N. Water St., Milwaukee, Wis.

The above firm, glove-makers for 39 years, has recently introduced their new product, a reversible plastic-coated glove so constructed that it can be worn on either hand. Using the slogan "4 Gloves Wear in Every Pair" (because of the reversible feature), the makers have developed them for practically every type of industrial use. For glove users with a particular, specific glove problem, Washington Glove Corp. has a testing laboratory to work out a satisfactory solution.

Fully Jumbo-cut, the gloves have a soft, fleecy lining for the ultimate in hand comfort. Strong yet pliable, because of the unusually superior impregnating plastics used, they are claimed to easily outwear leather or rubber gloves, customarily used for industrial work.

Available in knit wrist, short gauntlet, and full gauntlet models.

Inflated Drum Grinder

Nu-Matic Grinders, Inc., Dept. MF, 8224 Carnegie Ave., Cleveland 3, O.

An improved type of pneumatic drum grinder and sander is announced by the above firm. By varying the air pressure in the inflatable drum various degrees of contour polishing and grinding are possible. The drum can be mounted on flexible shaft machines. Simple deflating enables quick changing of the belts. The drum can be used on backstand idlers commonly used in most polishing rooms. Can be operated at 6,500 surface feet/minute (5,000 r.p.m.). Drum face is 3½" wide. Complete details may be obtained by writing to the above address.

Di-Phase Cleaner

Curran Corp., Dept. MF, So. Canal St., Lawrence, Mass.

Announcement comes from the above firm of a synergistic solvent possessing high grease-cleaning and carbon-removing properties. The new product is described as a di-phase solvent, and comprises a water-emulsion floating top layer, sealing a volatile chlor-aromatic solvent lower layer.

The laboratory also claims that the performance of this new di-phase solvent is substantially faster and will produce more complete and quicker results than can be obtained from present chlorinated type vapor degreasing solvents. Also, where chlorinated solvents can no longer be obtained because of critical shortages, the new di-phase solvent may be used as a replacement in the present solvent distilling cleaning tanks with good cleaning resulting from the new liquid-phase cold immersion method—no heat necessary.

Safety to personnel is said to be characteristic of the new di-phase sol-

vent, since its top water-emulsion seal prevents direct contact with skin, such as dipping the hands or splashing the active lower layer solvent directly into the eyes. The new solvent is also said to be fire-proofed by reason of its top water emulsion seal. In addition both phases are claimed to be completely water soluble and in event of a sprinkler protected building, the solvent will simply rinse away as a solution of liquid soap.

PATENTS

(*Continued from page* 80)

Plating with Alternating Current

U. S. Patent 2,548,867. *A. E. Chester, assignor to Poor & Co.*

A method of electrodepositing bright plates of metals from alkaline baths which comprises passing a plating electric current including direct and alternating current components of abnormal asymmetric sine wave form having peaks and valleys through an alkaline plating bath of a metal from the group consisting of zinc, cadmium, copper and tin, the valley voltage of the wave form being from 0 volts to a minimum of minus two-thirds of the positive peak value, and the alternating current component having a frequency within the limits from about 25 cycles to about 60 cycles.

Electroforming Musical Instruments

U. S. Patent 2,549,678. *R. M. Fiandt, assignor to C. G. Conn, Ltd.*

Apparatus for electroforming horn bells or the like comprising a depositing tank to contain an electrolyte having a solution of the metal to be deposited, an elongated cathode of a material to which metal does not readily adhere extending vertically into the central part of the tank and tapering from its upper end to a minimum diameter at its bottom, an annular anode of inert material around and spaced from the cathode and flaring from a minimum diameter at its upper end to a maximum diameter at its lower end, a solution inlet pipe discharging upwardly adjacent the lower end of the cathode, means for maintaining a constant circulation of solution from the inlet pipe for passage between the cathode and anode for the entrance end defined by the largest spaced relation between the cathode and anode to the outlet end defined by the least spaced relation therebetween, means supporting the cathode for rotation about a vertical axis, and angularly disposed vanes attached to the supporting means just beyond the outlet end within the tank to rotate the cathode in response to reaction with the circulating electrolyte.

Electropolishing Copper Alloys

U. S. Patent 2,549,737. *H. J. Wiesner, assignor to C. G. Conn, Ltd.*

The method of polishing copper and alloys in which copper is a major constituent which comprises connecting the alloy to be polished as an anode in an aqueous bath consisting essentially of a solution of a tripolyphosphate of an alkali metal and a material selected from the group consisting of boric acid, boric acid salts and salts of carbonic acid, said bath having a pH in the range from 7.0–8.5.

Automatic Electropolishing Machine

U. S. Patent 2,549,946. *M. A. Treuhaft and C. E. Swanson, assignors to Hudson Electrochemical Co.*

An improved method of electrobuffing metal, which comprises establishing a circulating bath of an electrolyte of a type which electrolytically removes metal from an anode with continuous production of a by-product film on the anode surface, immersing a metal object as anode in said bath with its surface which is to be electrobuffed, under the surface thereof and facing into a free portion of the bath to provide electrolyte circulation space across said surface, connecting and

maintaining in the same circuit a cathode, wiping the high areas of the surface being electro-buffed with physically separated wipers, continuously circulating electrolyte between said wipers, said wiping occurring only at a plurality of separated areas at any one instant, continually shifting the wipers relative to the surface being electro-buffed so that all such high areas on such surface are wiped, but the wiping of individual areas thereon is intermittent, the area of the immersed surface which is undergoing electro-buffing being substantially in excess of the portion of that area which is being wiped at any one time, whereby to allow the electrolyte to act on each area between said intermittent wipings, and continuing the wiping and free exposure to circulating bath and the maintaining of by-product film on the low areas thereof until minute high areas in which surface irregularities had existed are brought to a surface substantially co-directional and contiguous with adjacent surface areas to form a distinct-image-reflecting surface.

Conducting Silver Paint

U. S. Patent 2,550,345. *R. B. Gray and R. H. Steele, assignors to Erie Resistor Corp.*

A paint for producing a film having good electrical conductivity before drying and reduceable by firing after drying to a metallic silver film comprising silver oxide pigment, and an aqueous solution of a water soluble protective colloid holding the pigment in suspension.

Business Items

MacDermid Founder Honored by Local Newspaper

The August 12 issue of the *Waterbury Sunday Republican*, local newspaper of the Waterbury, Conn. area paid tribute to *Archie MacDermid*, founder and president of *MacDermid, Inc.*, well-known suppliers to the metal finishing industry.

The full-page pictorial story traced the history of the firm, paying special tribute to the president's qualities of leadership, perseverance, and integrity that have brought the firm to its present position as a 3 million dollar a year enterprise, and a leader in its field. The story also revealed the firm's latest expansion move, the opening of a new plant in Ferndale, Mich.

Almco Establishes Detroit Branch

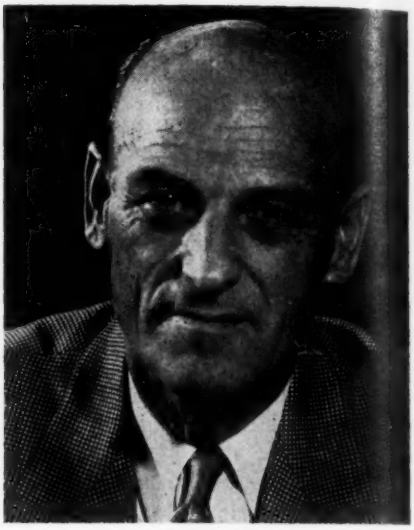
Almco, manufacturer of Almco Supersheen barrel finishing equipment and materials, has announced the recent purchase of the *R. F. Wuerfel Co.*, Detroit, former distributor for Almco products in Ohio, Michigan, and Indiana. The purchase involves the Wuerfel building and equipment. No changes are contemplated in the Detroit personnel, and *Mr. R. F. Wuerfel*, former owner, will continue in the capacity of Branch Manager.

This new Detroit Branch will continue to handle sales, service, sample processing and job processing for the three states previously served by the Wuerfel Company. Research and sample processing facilities are being expanded in order to provide a complete barrel finishing service to the manufacturers in the Detroit area. Sample processing and barrel finishing research for manufacturers will be furnished on a no-charge basis. Regardless of the finishing problem, manufacturers in the Detroit area are invited to submit it to this new branch for special research and sample processing without cost or obligation.

The Almco Supersheen line consists of a complete range of variable speed

barrel finishing equipment, handling and separating equipment, abrasive media and barrel finishing compound. Almco's main plant and general offices are located at Albert Lea, Minn.

Diversey Promotes Two in Sales



F. O. Spence

W. E. Noyes, vice-president in charge of sales of *The Diversey Corporation*, Chicago, has announced the promotion of former Pacific Division Manager *F. O. Spence* to regional sales manager. *R. C. Perry*, formerly assistant Pacific Division manager in charge of sales for the entire state of California, has been named manager to replace Spence.

As regional sales manager, a newly-created post in the Diversey sales organization, veteran D-Man Spence will concentrate on further expansion of sales coverage from a geographical standpoint. He will continue to exercise overall supervision of Pacific Division sales, inasmuch as the division is part of the sales region he has been named to head.

Spence's tenure with Diversey goes way back to 1931 when the company was feeling its first acute growing pains and laying the groundwork for expansion to the present proportions. He began as a territory salesman in Seattle.

With a previous background in the cleaning and sanitation field, he soon exhibited outstanding abilities and was given the task of pioneering Diversey sales in the northwestern part of the United States. Spence had been Pacific Division manager since 1939.

Perry began with Diversey in 1942 as a Food Industries field service rep-

resentative in the Southwestern Division. Soon he was named senior salesman for the Nebraska territory.

In 1945 he went east to assume an Eastern Division district managership.

R. C. Perry

Late in 1946 Perry was promoted to assistant manager of the Pacific Division.

Kirk & Blum Occupy New Plant

The Kirk & Blum Mfg. Co., one of the nation's leading fabricators and erectors of dust-collecting and fume removal systems, recently announced completion of the primary phase of an extensive modernization of plant facilities.

From its start 44 years ago, in a storeroom of the historic St. Charles Hotel Building at 232 E. Third Street, Cincinnati, O., the company has figured prominently in the industrial development of the Queen City.

Through its founders, the late *Sylvester W. Kirk* and the late *Richard J. Blum*, who organized the firm to meet "the urgent need for cleaner air in various industrial plants where manufacturing processes cause air pollution," the company expanded rapidly, as industries came to know the need for dust and fume removal systems.

After just four years in business, the Messrs. Kirk and Blum found the need for more manufacturing space. They then built and occupied the now famous "laundry building" which is "bombarded" by home runs hit (chiefly by the opposition) over the left-field wall of Crosley Field, home of the Cincinnati "Reds."

As a corporation, formed in 1923

to permit key employees and executives to acquire stock in the business, the firm soon found need for more and more space. After several expansions, the company bought the plant and eight-acre tract of the former Cincinnati Planer Co. in Cincinnati. In April, this year, the concern concluded its seven-month moving plan into the new structure.

The plant, which can accommodate further enlargement easily, is a one-floor plan brick structure that contains approximately 120,000 square feet. Facilities include an exterior and interior rail siding, overhead crane handling systems throughout, and other features.

Extensive modernization has been completed, and more is to follow.

Robert B. Goodsell to Represent Enthone in Middlewest

Robert B. Goodsell has been appointed sales and service representative for *Enthone, Inc.*, of New Haven, Conn., in the middlewest. His address will be c/o *Ardco, Inc.*, 6665 South Nashville Ave., Chicago, Ill. Mr. Goodsell is widely known for his activity in the American Electroplaters' Society. He has spent twenty-four years in the field of electroplating and metal finishing. His technical education was obtained in schools and colleges in Wisconsin. Some of the companies for whom he has worked in various capacities as plating foreman, control chemist and finishing superintendent include Greene Mfg. Co. and Racine

R. B. Goodsell

Plating Co., both of Racine, Wisconsin; Moe-Bridges Lighting Corporation of Milwaukee, Wis.; A. Y. McDonald Mfg. Co., Dubuque, Iowa; Nash-Kelvinator Corp., Kenosha, Wis.; and Camfield Mfg. Co., Grand Haven, Mich.

Mr. Goodsell's duties will be to act as technical service representative and consultant for all of Enthone's products including those for coloring and blackening of metals, stripping of enamels and metal coatings, plating upon aluminum and general products pertaining to cleaning and pickling.

United Chromium Now Sells Rectifiers

United Chromium, Inc., Dept. MF, 100 E. 42nd St., N. Y. 17, N. Y.

Selenium rectifiers for plating and anodizing have been added to the line of metal finishing processes, materials, and equipment sold by *United Chromium, Incorporated.*

These Unichrome selenium rectifiers are available in units ranging up to 10,000 amperes current capacity, starting at 250 amperes up through any multiple thereof. The voltage ratings likewise cover a wide range, from 6 to 50 volts. For example, units up to 10,000 amperes are available in 6, 9, and 12 volt ratings; up to 8,000 amperes, also in 18 volt rating; and up to 5,000 amperes, also in 25, 40, and 50 volt ratings. All these rectifiers can be supplied as self-contained units with built-in controls, or with remote controls, to give zero to full rated output voltage. They can be supplied also as basic units with no output voltage control. All the rectifiers are very conservatively designed as to both current and voltage ratings.

Self-contained Unichrome Selenium Rectifiers can be equipped with 36 position tap switch controls or 22 position non-interrupted voltage controls. Where infinite changes of voltage or current are required the Unichrome selenium rectifier can be equipped with a saturable-core reactor that provides the ultimate in non-interrupted voltage or current control. Automatic controls for voltage and current can also be supplied.

Unichrome selenium rectifiers are being made to United Chromium specifications by *Richardson-Allen Corp.* They are manufactured with only the highest grade, American-made selenium plates, triple-coated to provide unsurpassed protection against corrosion. All wiring is of the non-inflammable type. Transformers are made for heavy duty use with glass and mica insulation. Before shipment is made, each rectifier is tested at rated load as a completely assembled unit including meters, controllers and starters on self-contained units.

Cro-Plate Elects New Executive Officers

The Cro-Plate Co., Inc., Hartford, Conn., announced recently the election of *Alan W. Brown* as President to succeed the late *Theodore L. Brantly, Jr.*, who met his death in an automobile accident August 8, 1951. Simultaneously the company announced the election of *Robert C. Allen*, previously Treasurer, as Executive Vice President and Treasurer.

Mr. Brown is a co-founder of the company, and as Executive Vice-President has been in charge of manufacturing and engineering operations. It

R. C. Allen

is Mr. Brown who developed the several radically new electroplating processes made available to industry by the firm in 1946.

Mr. Allen, a native of Hartford and now a resident of East Longmeadow, Mass., left the Springfield public accounting firm of Miller, Morgan, Inc. shortly after the founding of Cro-Plate to become Treasurer of the new company. During World War II he served in the European theater as a Major in the Field Artillery.

New Firm in Industrial Rubber Products Field

A new firm in the industrial rubber products field is the *Miller Products Co., Inc.*, of 29 Warren St., N. Y. 7, N. Y. The firm handles a complete line of protective aprons, boots, clothing, footwear, gloves, tape, and tubing.

Selenium for Rectifiers To Go On Allocation

A method of allocating selenium will have to be devised in the immediate future in view of its increasing scarcity, the *National Production Authority*, U. S. Department of Commerce, recently told a representative group of manufacturers of selenium rectifiers.

There will not be enough high-grade selenium to meet requirements of industry and the mobilization effort, NPA emphasized.

The widespread application and use of selenium rectifiers has been an outgrowth of the postwar expansion of the electronics and television industries. This increased usage has outstripped the available supply of the metal, which is produced as a by-product of certain copper refining operations.

NPA advised the group that exploratory work is being conducted by the Government to develop new sources of selenium. However, this is a long-term project and for the present no increase in selenium supplies is anticipated. Because of the recent work stoppage at an important Utah copper smelting plant, selenium supplies undoubtedly will become more depleted, NPA said.

The group reported that their stocks of selenium had declined to as low as a three-day supply and that there is a possibility that all DO rated orders will not be filled. The Industry also asked that selenium supplies now going to the glass industry for the manufacture of hard clear glass (milk bottles, for instance) be diverted to the rectifier industry.

NPA said that the immediate problem is one of establishing a system of allocating available supplies. NPA officials said they would consider the other suggestions.

Minnesota Mining Establishes Texas Office

Establishment of a regional sales office and warehouse in Dallas, Tex., was announced recently by officials of *Minnesota Mining & Manufacturing Co.*

The new facilities, designed to permit better service for 3M customers in Texas and neighboring states, are located at 1221 Dragon St. and were opened for business on Sept. 4.

Officials in charge of the new office and warehouse are *Walter F. Gruetzman*, office manager; *Ray Paulson*, sales manager for abrasives and related products; and *Fred Richardson*, sales manager for cellophane tapes.

The new branch is another link in 3M's nationwide expansion program by which the company is improving service to industrial and retail customers across the nation.

Course in Electroplating

Students of electro-plating will have courses designed for their needs made available in the Fall series of night school courses sponsored by the Ex-

tension Division, University of California at Los Angeles.

A course in the *Science and Practice of Electroplating* was scheduled to start September 18 in Room 610 Hill Street Building in downtown Los Angeles. *Mitchell Raskin*, superintendent of the finishing department of Globe Lighting Products Co., Los Angeles, has again been selected as the instructor, a post he has filled with distinction for a number of years.

The course will consist of 18 sessions, meeting each Tuesday from 7 to 9:30 p.m. Included in the program of instruction will be the chemistry of plating, equipment, cleaning, pickling and stripping, racking methods, study of solutions and study of the various types of plating from brass to zinc.

Another course with elements of interest to the plating industry is one entitled *Application of Metallurgical Principles to Aircraft*. This class is to be taught by *J. L. Waisman*, metallurgical engineer of Douglas Aircraft Co.. Starting September 25, this class was scheduled to meet each Tuesday from 7 to 9:30 p.m. in Royce Hall, University of California at Los Angeles. Instruction is to deal with the principles of physical metallurgy applied to airplane design, manufacture and inspection. It will include manufacture, forming, joining, heat treating and finishing, specifications, testing and inspection, new high strength titanium and aluminum alloys. This course is intended for those performing metallurgical engineering or allied work.

No October Nickel Allocations Without DO Rating

A recent announcement of the Nickel Section of the NPA advises that no October allocations for nickel will be granted without a DO rating. This applies to chemicals as well as anodes.

Clarence VanDereau Promoted by Westinghouse

Mr. Clarence VanDereau, a well-known figure in the electroplating world, one of the early Supreme presidents of the A.E.S. and presently an Honorary Member, was recently promoted to an important post with Westinghouse Electric Co.. He has now been named to the position of General Works Manager in charge of both the Mansfield and Columbus plants of that firm. The new Mansfield plant of Westinghouse, to be completed by early 1953, will manufacture jet engine parts.

New Firm in Electroplating Research and Development

Electro-Met Research Associates and the Gary Company have recently combined forces to form the new firm, *Electro-Lab Processes, Inc.*, with laboratories and offices at 3566 Colerain Ave., Cincinnatti, O. The new organization will have an expanded staff, but will retain the former personnel and accounts.

Chicago Platers Hold Mass Meeting to Plan Attack on Nickel Thieves

Following a mass meeting on August 21st, the *Chicago Electro-Platers Institute* announced it would pay a reward of $2,500 for information leading to the arrest and conviction of a gang responsible for a series of Chicago electro-plating shop burglaries in which scarce materials, principally nickel, have been stolen.

The reward was announced after a committee from the Institute conferred with Chicago Police Commissioner *Timothy O'Connor*. Special details are being assigned to the hunt by O'Connor.

The loot in 30 burglaries reported to the Chicago Electro-Platers Institute since last October 6th is valued at $50,000 dollars at the normal market prices under the Federal allocation program. In the open or "grey" market, the stolen metals would probably bring around $250,000.

The loot in the 30 burglaries included 40,000 pounds of nickel, 3,000 pounds of cadmium, 3,000 pounds of lead, 400 pounds of copper, and 500 pounds of brass.

Manufacturers' Literature

Fiberglas Plating Tanks

The Chemical Corp., Dept. MF, 54 Waltham St., Springfield, Mass.

A new technical data sheet recently published by the above firm lists the various solution that can be contained without harm in their line of fiberglas Pla-Tanks, the new resin-bonded tank that is light in weight, is made of non-critical materials, can be easily repaired, is non-rusting and needs no outer protective coating. Nominal sizes of Pla-Tanks are from 25-250 gallons, but smaller and larger units can be made to order. Copies of this data sheet may be obtained by writing to the above address.

Industrial Polishing

Schaffner Manufacturing Co., Dept. MF, Emsworth, Pittsburgh 2, Pa.

This firm has published a 12-page booklet describing modern techniques of industrial polishing and buffing as related to the varied buffs, polishes and plating supplies the company manufactures. The booklet serves simultaneously as a catalog listing Schaffner products.

The booklet contains dozens of helpful technical tips on how to get better results in metal, plastics and wood polishing operations. It defines and explains "cutting down" and "coloring" operations in the buffing

process. It lists Schaffner compounds suitable for each material and each process.

The Schaffner Co. makes a complete line of polishing, buffing, and finishing compositions in spray, bar and paste form individualized for use in treating aluminum, brass, copper, steel, plastics, wood and such plated surfaces as chromium, gold, nickel and tin. They are employed in the finishing of such widely diverse items as huge drop forge presses and little bits of costume jewelry.

The booklet may be obtained free of charge by writing.

Uses for Coated Abrasives

Behr-Manning Corp., Dept. MF, Troy, N. Y.

The above firm, a division of the *Norton Company*, announces the availability of a new informative literature packet, "Blueprints for Faster, Better Production." Coated abrasive specialties and solid abrasive oilstone specialties designed for the metal finishing fields are described in detail.

Contained in a folding cover that can be expanded into a permanent wall chart, "blueprint" case study discussions of individual finishing problems and their solutions are graphically presented. Copies are available by writing to the above address.

Bibliography on Sequestering Agents

Alrose Chemical Co., Dept. MF, 180 Mill St., Cranston 5, R. I.

A complete reference bibliography on the uses and applications of ethylene-diamine tetraacetic acid is available from the above firm. This bibliography lists the many references to the use of this very important material in industrial processes, where it acts to dissolve metallic ions in solution and render them innocuous. Analytical methods for using the material are also given. All references are within the past three years, making the information as up-to-date as possible.

New Degreaser Bulletin

Phillips Mfg. Co., Dept. MF, 3475 W. Touhy Ave., Chicago 45, Ill.

A new illustrated bulletin describing the company's line of degreasing equipment has just been published by the above firm. The bulletin gives a detailed picture of how Phillips degreasers operate, what types of manufacturing industries use degreasers, and to what specific applications vapor degreasers can be put. The full line of vapor degreasers is shown in the bulletin along with the features, capacities and uses of each specific type unit.

There are a number of photographs showing industrial applications of degreasers for both tank-type and conveyorized units.

The degreasing process itself is explained for the benefit of those who may not be completely familiar with it. A copy of the new bulletin may be obtained by writing.

Rubber Lining Services

Automotive Rubber Co., Inc., Dept. MF, 8601 Epworth Blvd., Detroit 4, Mich.

Automotive Rubber Company, Inc. has prepared a new catalog completely describing their plant facilities, including their new rubber compounding mill and various products and services which they now have to offer.

Automotive Rubber has been identi-

fied for years with the automotive, aircraft, electrical, chemical and metal industries as a source for sheet rubber lined tanks and form-dipped rubber parts, sold under the "ARCO" trade name.

Mr. R. L. Redmond, Vice-President and Director of Sales, explains that the company's general expansion program now enables them to offer molded and extruded products as well, and that these are covered in the new catalog.

Copies may be obtained at no charge.

Plating in The Graphic Arts

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above firm has issued new booklets and bulletins covering iron, zinc, chromium and plating in the graphic arts, as follows:

THE ELECTRODEPOSITION OF IRON, by *A. D. Squitero*. This booklet covers recent improvements in methods as well as a description of the solutions involved. Uses for iron plate as a substitute for copper and nickel are enumerated as well as effective methods for the resizing of worn parts.

TECHNICAL INSTRUCTION ON S-B PROCESS FOR ZINC PLATING. A newly revised bulletin bringing this process up to date. The process produces zinc deposits satin bright to bright in color, and particularly receptive to conversion coatings such as Lusteron, Cronak, Iridite and Anozinc.

ENGINEERING FOR ELECTROPLATING IN THE GRAPHIC ARTS, by *R. F. Ledford*. This booklet covers the many details to be considered in the design of a plating tank; the electrical equipment involved with its effects on related problems; the comparative efficiency of aluminum and copper bus bars, and such other matters as temperature and connections, electrifying a tank, controls, etc.; heating and cooling solutions; solution agitation; semi-automatic and full automatic plating.

H - VW - M CHROM-FLO ANODE BULLETIN CFA-100. A departure both in alloy and design, the Chrom-Flo chromium plating anode is said to offer many attractive performance qualities. The use of special alloy lead Type "S" reduces the formation of insoluble chromate film on the anode. An open cross-section design makes higher current density possible because of better circulation of solution and increased anode surface exposure. Easier handling is possible because of decreased weight. These anodes are claimed to offer better covering power, especially on difficult-to-plate parts, because of the wider current density range, while open construction permits current to reach both sides of the anode, thus increasing its active area.

Copies of any of these bulletins may be obtained by writing to the above address.

Caustic Soda

Pennsylvania Salt Mfg. Co., Dept. MF, 1000 Widener Bldg., Philadelphia 7, Pa.

This company has just issued a new Caustic Soda bulletin prepared for all users of this important basic chemical. Divided into four sections under tabbed headings, the booklet provides handy reference for particular problems on purchasing, handling and storage, equipment design and technical data.

The section on equipment design has been especially prepared to deal

with the problems of engineering, construction and maintenance personnel. Charts and tables showing freezing point, specific gravity at various temperatures, NaOH content and density and other properties of caustic soda have been designed to give technicians and chemists readily-available answers to their particular questions.

A separate leaflet covering instructions for safe handling of caustic soda tank cars is inserted in the flyleaf of the main bulletin. Detailed instructions for steaming and unloading 50% and 72% caustic soda, as well as general information and personal precautions are included.

Requests for the bulletin and leaflet should be written on company letterhead.

Preparation of Aluminum for Spot Welding

Oakite Products, Inc., Dept. MF, 118 Thames St., N. Y. 6, N. Y.

A thoroughgoing discussion of efficient methods of chemically preparing aluminum for spot welding is provided in a free 18-page booklet recently published by the above firm, manufacturers of specialized industrial cleaning and related materials.

After first stressing the importance of proper preparation of aluminum to obtain the oil-free, uniformly-low-resistance surfaces required for the production of quality welds, the booklet supplies specific recommendations on materials, procedures and equipment for performing the preparatory operations of (1) cleaning; (2) deoxidizing; (3) rinsing; and (4) drying. The recommendations provided are based on actual, successful experience in hundreds of industrial installations preparing aluminum for spot welding with the materials and methods described. Detailed information is also supplied on recommended solution concentrations and solution temperatures for employing the materials discussed, as well as helpful immersion time schedules for deoxidizing aluminum alloys of various gauges. Of interest, too, is a section of the booklet reporting on specially-engineered cleaning aids—devices which simplify the determination of solution strength and solution temperatures in equipment used to perform the operations listed above.

Handbook on Stainless Steels

Allegheny Ludlum Steel Corp., Dept. MF, 2020 Oliver Bldg., Pittsburgh 22, Pa.

A new data and handbook on the stainless steels has been published by the above firm and is now available for free distribution to users of the heat and corrosion resistant metals.

In order to fill the growing needs of fabricators and design engineers for more complete on-the-job reference data, material contained in previous handbooks has been completely rewritten and categorized and much additional information has been added. In its 120 pages the cloth-bound volume discusses approximately 40 different types of Allegheny Metal stainless steel and covers each type from standpoints of analyses, fabrication, heat treatment and special conditions of service.

The first of seven chapters in the book is concerned with selecting the proper type of stainless for a given application. A selector table containing about 30 types, including both nickel-chromium and straight chromi-

um steels, lists about 40 properties broken down in the general classifications of physical data, electrical properties, heat resistance, working and treating temperatures, mechanical properties and creep strength. A second group of tables in this chapter lists the corrosion resistance of the steels to the various media, including organic substances, acids and salts.

Subsequent chapters discuss each type of stainless separately and in more detail and supply specific information about heat treating, fabrication and certain special conditions in service. Separate chapters are given over to discussions of heat resistant properties and low temperature properties of the metals. Copies of the book may be obtained from the company's offices.

Plant Offers Plating Facilities for Coiled Strip and Wire

A booklet recently issued by the *American Nickeloid Co., Peru, Ill.* offer its facilities and plants for use where needed.

With a home plant in Peru, Ill., and a branch plant at Walnutport, Pa., the manufacturer offers its metal plating facilities (53 years of experience) for re-armament—wherever they can be used to speed defense production and conserve on vital materials.

Dramatically illustrating more than 50 common peacetime applications of American Nickeloid pre-plated metals, the booklet shows the switch made to war production during World War II. Electrical appliances and display fixtures bowed out to signalling mirrors, first aid kits, bullet jackets and the wartime zinc-plated steel penny—just a few of the production conversions made for the treasury department, ordnance, engineers, AAF, army and navy signal corps.

The booklet enumerates in detail the company's machinery, tools, presses, power, dock facilities, etc., available in its two plants' 151,000 square feet.

Plating finishes offered are copper, chromium, nickel and brass on such bases as steel, brass, copper, aluminum, tinplate, nickel silver and zinc. If need be, American Nickeloid can expand its finishes to include zinc, cadmium, silver, and anodizing aluminum. These finishes come in bright or satin, plated on one or two sides. These preplated metals are available in sheets, coils or flat wire in a wide range of gauges and tempers.

The booklet is available by writing.

Alternate for Scarce Chromium-Nickel Stainless Steels

A 12-page illustrated booklet, "*A Guide to Type 430 Stainless Steels as Alternates of the 18-8 Series*," has just been released by Republic Steel to help manufacturers affected by defense restrictions on the use of chromium-nickel stainless steel. The booklet describes Type 430 Stainless Steel and its modifications (which contain no nickel) in comparison with Types 302 and 304 (now restricted due to nickel content). Data are given concerning performance under corrosive conditions, and the mechanical properties related to high temperature uses. Drawing, forming, welding, and polishing of Type 430 stainless steels are discussed at length, with references to

the differences in these operations arising when 430 is used as an alternate for Types 302 and 304. The booklet may be obtained from *Republic Steel Corp., Cleveland 1, O.*

Corrosion Resistance of Copper Alloys

The American Brass Company, Dept. MF, Waterbury 20, Conn.

For twenty-five years, The American Brass Company's technical staff has conducted continuous laboratory research and field study of the nature of corrosive attack on copper and copper alloys. The results of these studies have been published now in a 24-page booklet, "*Corrosion Resistance of Copper and Copper Alloys.*" This publication, first of its type in the industry, explains the chemical and physical nature of corrosive attack in its various forms. Included is a tabulation indicating the relative corrosion resistance of the principal types of copper and copper base alloys when in contact with 183 different corroding agents. This booklet, Anaconda Publication B-36, is available without charge.

Literature on Phosphate Process

International Rustproof Co., Dept. MF, 12507 Plover Ave., Cleveland, O.

This firm has issued new literature and bulletins describing their new Irco 66 process for phosphating ferrous and non-ferrous metals to a standard, uniform weight of coating. The process is applicable by dip or spray, and over a wide temperature range. The process is also said to remove rust and oxide before imparting the phosphate coating. Non-sludging, and requiring no oxidizing agents to maintain efficiency, the process is claimed to be superior to most other similar processes now on the market. Copies of the bulletins may be obtained by writing to the above address.

Abrasive Belt Machines

Porter-Cable Machine Co., Dept. MF, Syracuse 8, N. Y.

The above firm has issued a new booklet which should serve as a basic manual on the subject of abrasive belt finishing and grinding. In addition to describing and illustrating Porter-Cable's machines in great detail, it gives a lot of factual information on the general subject and the applications of modern belt finishing equipment in today's re-armament program for increased efficiency and production. The entire range of belt equipment, including auxiliary machines and attachments, is described. Copies may be obtained by writing to the above address.

Machining Coolant Permits Easy Cleaning for Plating

F. E. Anderson Oil Company, Dept. MF, Portland, Conn.

The above firm offers free copies of a new booklet describing Lusol—their all-chemical cutting fluid. The booklet covers in detail properties of the coolant: elimination of dermatitis and odor, elimination of cleaning and degreasing operations before painting, plating or assembly. It contains complete information on cleaning of machines, mixing and maintenance of coolant solutions, plus case histories of the product in use in almost every type of metalworking operation.

Index of Military Purchasing Offices

A new publication of the Munitions Board lists the various products purchased and which departments of the military purchase them. Anyone selling products to the government services can benefit from this handy directory. Copies may be obtained from the *Central Military Procurement Office, Munitions Board, Pentagon, Wash 25, D. C.*

Industrial Tapes for Government Work

Industrial Tape Corp., Dept. MF, New Brunswick, N. J.

The above firm, producers of Permacel and Texcel pressure-sensitive tapes, has begun distribution of a new booklet, "*Government Tape Specifications*," which classifies pressure-sensitive tapes according to official U. S. Government specifications.

Purpose of the booklet is to assist purchasing agents and engineers in determining which tapes meet currently active government specifications.

The booklet can be obtained from sales representatives of Industrial Tape Corp., or by writing directly to the above address.

How to Clean Metals in Aircraft Production

Oakite Products, Inc., Dept. MF, 118 Thames St., New York 6, N. Y.

The above firms, manufacturers of industrial cleaning, and allied materials, have announced the publication of a 48-page illustrated booklet describing specialized materials, procedures and equipment for use in cleaning metals, preparing metals for finishing, and for other cleaning and related processes involved in aircraft production.

Based on actual, successful applications in leading aircraft manufacturing plants, the booklet reports in detail on specific materials and methods for performing a wide range of production cleaning and related operations. Among the many operations on which helpful data is provided are the following: preparing aluminum for anodizing; preparing aluminum for spot welding; preparation of aluminum for painting by still tank method and in spray washing machines; cleaning aluminium before and after heat treating; stripping paint from aluminum; cleaning magnesium for finishing; treating wash water in paint spray booths; cleaning aircraft metals for inspection and assembly; and many other operations.

Also presented in the booklet are helpful recommendations on equipment designed to simplify cleaning and rinsing operations, save manhours and materials, and help assure desired end results with maximum economy. Readers desiring free copies of the booklet may obtain them by writing.

Polishing Slush Metals

Barker Bros., Dept. MF, 1664 Summerfield St., Brooklyn 27, Mass.

This firm has issued a technical data sheet giving instructions on how to best polish and buff slush metal castings for maximum beauty of finish. They have worked out a buff-composition technique that is claimed to give a superior finish to this type of metal. Copies of this data sheet are available by writing to the above address.

MOTOR CITY PLATING NEWS

by

Edward Finne

Are we platers tough? As proof, we offer the following news item; dated at San Antonio, Texas.

"San Antonio, Texas—A rattlesnake died after it bit *Demetrio Gomez.*

Gomez, a civilian employee at Kelly Air Force Base, said the rattler struck him on the leg, had convulsions, crawled 15 feet and died. Gomez suffered no ill effects and he explained it this way:

'I'm head of the plating unit at Kelly, and handle a great deal of sodium cyanide. My body is so full of this poison that I've built up a resistance to it, but I guess the snake hadn't'."

The A & P Finishing and Mfg. Co., 17760 Clarann Ave., Melvindale, Mich., has appointed *Charles L. Kepley* as chemical field engineer.

The company specializes in corrosion engineering and is equipped to apply acid and corrosion-resistant linings and coatings to chemical and plating equipment. One of their services that looks promising is the coating of steel plate coils with an acid and heat resistant phenolic coating. Another is their process of lining tanks with plastisol which will stand boiling temperatures and would be ideal for hot pickling acids.

Kepley is a 1927 graduate of Ball State College, Muncie, Ind., and he taught several years before entering industry. He was formerly chief chemist in charge of control laboratories and manager of glycerine and phthalic anhydride plants for Reichold Chemicals, Inc. He also was supervisor in the Air-Dry Synthetic Enamel division of the Ditzler Color Co.

OBITUARIES

Guy M. Cole

On Friday, August 10, Mr. Guy Cole, well known process Engineer at Ternsted Div. of General Motors, Detroit, died suddenly. He had just returned from the annual convention of the A.E.S. in Buffalo, where he acted as a Technical Sessions Chairman. His death was attributed to a ruptured appendix. He was very active in A.E.S. affairs, and was an officer of The Detroit Branch.

Lloyd S. Williams

It is with sincere regret that we announce the death of *Mr. Lloyd S. Williams*, president of the *Armalite Co., Ltd.*, of Toronto, Canada, on Sunday, July 29th, 1951. Mr. Williams was well known and very popular with his business associates, and his untimely death is deeply felt by his many friends.

NEW BOOKS

Chlorination of Sewage and Industrial Wastes

Pub. by the Federation of Sewage and Industrial Wastes Ass'n., 325 Illinois Bldg., Champaign, Ill. Price $1.25.

This is No. 4 in the series of Practice Manuals issued by this association. It covers the use of chlorine in

industrial waste treatment, not only for electroplating wastes, but for a wide range of other industrial wastes. It gives the chemical reactions, dosages required, method of use, equipment required, handling and safety precautions, as well as a number of other important topics. Copies may be obtained from the above address.

Plating Room Controls for Pollution Abatement

Pub. by Ohio River Valley Water Sanitation Commission. Price $.50.

This publication discusses the measures that can be taken to eliminate or minimize the waste volume and concentration from plating and finishing departments, thus helping to prevent excessive pollution of waterways. The measures also indicate that considerable cost in materials ordinarily wasted in the plating room can be realized by close application of the principles outlined. This booklet was prepared by the *Metal Finishing Action Committee* of the Ohio River Valley Water Sanitation Commission, and is written by men who are familiar with the plating problems involved.

News from California

By Fred A. Herr

Indicative of the impact the Korean war effort has had on the Southern California plating industry is the experience of *Bowman Chemicals, Inc.*, Los Angeles. In July, 1950, this firm was engaged 100% in metal finishing, by the chemical immersion process, of television parts, metal furniture, recording machines, heaters, Diesel injection equipment, tubing, gears, to cite a few of the varied products handled.

The swing to defense work began shortly after the Korean conflict drew into it the United States and the U.N.. By December, 1950, Bowman Chemicals found that 20% of its output concerned defense items. This figure had increased to 35 per cent by March of this year. In mid-August, *J. M. Bowman*, president, estimated that 75% of the output at that time concerned the defense program. Aircraft and electronic parts, guided missiles, jet propulsion parts and various Army and Navy items were going through the plant then in increasing volume, with every indication present that the figure of 75% of total output might go even higher.

To meet this increased activity, for over-all volume has also increased substantially, the firm has a $25,000 expansion program underway. This figure includes building additions to the factory at 4606 Long Beach Avenue.

The Bowman brothers—J. M. as President and L. D. as vice-president and secretary, operate the firm. J. M. was formerly active as plating supervisor for one of Hollywood's largest film studios. L. D. joined him in Bowman Chemicals, Inc., several years ago, after a tenure of eight years as controller for Solar Aircraft Co. in San Diego, and, previously, in a similar capacity with Pittsburgh Plate Glass Co.

Small manufacturing and fabrica-

ting plants in Southern California making use of steel, copper and aluminum were notified September 6 to refer their metal allotment inquires to the local field offices of National Production Authority in Los Angeles and San Diego instead of writing to Washington headquarters.

Edwin Bates, manager of the Los Angeles N.P.A. office, said the Los Angeles office at 112 W. 9th St., and the San Diego office at 435 W. Broadway, have staffs qualified to handle small applications on metal allotments. He declared that all applications for small CMP allotments, even though sent to Washington, are referred back to the field offices.

Dr. T. G. Kennard and *John F. Drake*, two well known figures in Southern California electrochemical circles, have announced completion of new testing and analytical laboratories which they operate under the firm name of *Kennard and Drake*. The new building at 3365 East 14th Street, Los Angeles, is a 30 x 50 foot concrete block structure specifically designed for testing laboratory purposes. It is equipped with some $10,000 worth of testing facilities for the making of physical, chemical and spectrographic tests, plating solution analyses, thickness of coating tests, and metallographic examinations.

Gilbert Extale, Chief chemist of the General Electric Co.'s Hotpoint ironer plant in Ontario, Calif., is scheduled to address the Meehanite Research Institute in New York City on November 7. His subject will be "Foundry Sand Control." He also plans to visit the G.E. plants in Waterford and Schenectady, N. Y., and Pittsfield, Mass.

Marcus Rynkofs, president-owner of Liberty Plating Company, Los Angeles, and Mrs. Rynkofs, left September 1 for a month's business and pleasure trip which was to take some 7,000 miles by train and automobile.

About 35 stops were on their itinerary when they left Los Angeles on the Superchief on September 1, including quite a number of plant visits. Among the "pleasure" items was a stop at Detroit, Mich., to pick up a new Cadillac, and subsequent visits in the new car to Pittsburgh, Pa., (Mr. Rynkofs' old home town) New York City, Atlantic City, Washington, D. C., Cleveland, O., Chicago, Kenoska, Wis., Minneapolis, Minn., Salt Lake City, Utah (where a visit with brother Victor Rynkofs was on the schedule) and thence home via Las Vegas, Nev. The operation of the Liberty Plating Company was in the capable hands of sons Stanley and Jean during the boss' absence.

Assembly and coil winding operations of the *Helipot Corp.*, manufacturer of scientific instruments and an affiliate of *Beckman Instruments, Inc.*, have been transferred from 916 Meridan Avenue, South Pasadena, to a 14,500 square foot building at 350 West Colorado Avenue, Pasadena. Consolidation of all Helipot operations in one plant is contemplated as soon as adequate facilities can be obtained.

Applied Research Laboratories recently moved into a new plant at 3630 San Fernando Road, Glendale, Calif., which is reportedly designed especially to meet the needs of manufacturing quantometers and source units for production control and industrial research. The new building is equipped for manufacturing specialized parts, final assembly, testing and inspection.

A methods research laboratory is also included. A new building now under construction in Montrose, Calif., will upon completion house the firm's development divisions and general offices.

Some of the players of the Platers' baseball team which immersed and thoroughly polished-off a Suppliers' team by a score of 15 to 12 at the recent annual picnic of Los Angeles A.E.S. Branch, are shown. Pictured are, left to right: E. R. "Dick" Richardson, Dexter Halldin (picnic chairman), Charles C. Wirth, Howard Woodward, Umpire Don Bedwell; unidentified; Fred A. Herr, Gus Brigantino (the big Smile).

Glen J. Beckwith, of Metallon Products, Inc., Los Angeles, has returned from a five weeks trip to the middlewest and east which he described as 90% business and 10% pleasure. He included among the "10%" such activities as seeing "South Pacific" and several other plays in New York City.

The new California distributor for *Park Chemical Company*, of Detroit, Mich., is the *California Alloy Products Co.*, of South Pasadena, Calif. Warehouse stocks of the Park Company's salt baths, carburizing compounds, quenching oils, protective coatings and other items will be available in Southern California, it was announced.

Faith Plating Co., Los Angeles, has increased floor space and production facilities for repairing and finishing automobile bumpers at its Hollywood shop, 7141 Santa Monica, Blvd.

The Metal Finishing Association of Southern California, Inc. held a special dinner meeting at Rodger Young Auditorium, Los Angeles, on the night of

August 16 to hear a report from its president, *E. T. Brown*, who had spent several previous weeks in Washington, D. C., attending the initial meetings of the National Advisory Committee for the electroplating industry.

Mr. Brown, of Cadmium and Nickel Plating Co., Los Angeles, in mid-summer was appointed to the N.A.C. by the National Production Authority as a member representing the metal finishing industry of Southern California.

He reported that the meetings in Washington had accomplished much of value for the finishing industry.

For one thing, he declared, the Government now is fully conversant with the fact that job-plating is a business in its own right and is extending recognition as such, rather than regarding it as a division of the chemical industry, which has been the case heretofore.

Mr. Brown stressed that being recognized and given consideration by high-echelon Government offices as an *industry*, rather than as a mere section of another trade, would be of considerable value to platers in the event all-out mobilization of industrial power occurs. In the future there will be a representative of the job-plating industry on all advisory committees dealing with any of the critical metals.

Mr. Brown reported further that job shops will be given first opportunity at Government work. He explained that before Certificates of Necessity or necessary priorities are issued for plating facilities in "captive shops," it will first be ascertained that job shops in the area are either unable or unwilling to handle the work. If existing job shop facilities are adequate and time schedules can be met, then prime contractors will be encouraged to use them rather than putting in new installations of their own.

Mr. Brown reported that NPA is aware of the serious effect which scarcity of metals, particularly the shortage of nickel, is having on industry, and is making efforts to aid the plating industry. The NPA stressed, however, that it does not expect to relax Nickel Order M-14.

Even though Mr. Brown was appointed by the NPA to represent the industry of Southern California, rather than the finishing association alone, the board of directors of the Metal Finishing Association of Southern California voted to assume responsibility for defraying Mr. Brown's traveling expenses. A portion of the cost was defrayed out of the association treasury, and non-member plating firms were permitted to contribute. These were Accurate Plating Co., Advance Plating Co., Baker Metal Finishing, Inc., Barber-Webb Co., Bedwell & Corum, Bowman Chemicals, Inc., Boyles-Snyder Co., Electro-Plating Shop, General Plating Co., Modern Plating Co., Pacific Enameling Co., PDK Plating, Inc., Southern California Plating Co., and Sunset Plating Co.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Philadelphia Branch Annual Educational Session

The Annual Educational Session and Banquet of the Philadelphia Branch will be held at the Broadwood Hotel on Saturday, November 17, 1951. The educational portion of the program will start at 2 p.m., to be followed by a banquet and entertainment starting at 7 p.m.

Indianapolis Branch

The September meeting was held at Fox Steak House, where the usual steak dinner was served to 25 members. *Mr. A. Kriese*, President, introduced *Mr. W. Binai*, who was the first president and organizer of the branch. The delegates to the A.E.S. national convention gave their report, following which *Mr. E. Lundberg*, Librarian, introduced the speaker of the evening, *Mr. Robert Kryter*, Treasurer of the Esterline-Angus Co. and a nationally known expert on Atomic Energy. His subject "The Present Version of the Atomic Story."

Mr. Kryter reviewed the history and orgin of atomic energy dating back 53 years to the discovery of radium by Madam Curie. He related that the three present atomic energy plants are already out of date because of the recent developments. The new plant being built at Paducah, Ky. would have all the latest developments in this field. He spoke of the destruction that could be caused by the new A bomb which is larger than the one dropped over Japan in 1945. He also reviewed the new hydrogen bomb and the possible destruction by this bomb.

Although his talk was of desolation and destruction, there is some bright future for atomic energy in the field of surgery and treatment of various illness, and also in the field of industry. Because of the length of Mr. Kryter's talk all business of the branch was postponed, with the exception of the election of 3 new members; *Mr. Bert SerVass, Mr. Paul Simmons* and *Mr. R. Branigan.*

Los Angeles Branch

A round-table discussion of specifications for plating and other finishing processes provided the highlight of the educational program as The Los Angeles Branch of the A.E.S. opened its fall series of meetings on the night of September 12.

An overflow attendance of more than one hundred members and guests thronged the Green Room of Rodger Young Hall as president *Roy Lostutter* called the session to order.

Peter V. Rodgers, of Oakite Products, Inc., and *Irving Halpern,* of the L. H. Butcher Company, served as panel members, with *Earl Arnold,* the branch's librarian, acting as moderator of the discussion. This trio answered questions from the floor with respect to meanings and interpretations of specifications as they apply to the electroplating industry.

The subject was one of extreme timeliness and brought about spirited discussion and counter-comment as members and guests fired a liberal barrage of questions at the panel trio.

Obliging with much valuable advice and latest information on aircraft specifications was *Ralph Alexander,* chief chemist of North American Aviation, Inc. The members took full advantage of Mr. Alexander's willingness to supply as much information as he could.

The discussion dealt with the purpose of specifications and how they can be used as a buying guide for those who are not too familiar with the governmental requirements; to set a maximum and minimum limit for coating thickness; to make processes uniform; to specify material for use.

The point was brought out that some specifications are so general in nature that only the most flagrant errors could cause rejection. On the other hand, it was stated, other specifications are so rigid that it is almost impossible to comply with them.

Mr. Halpern gave an impromptu talk on specifications in which he attempted to cover the subject in a general way. He next called for specific questions on specific phases of specifications. Replies were given either by panel members or by men in the audience.

Subjects discussed included how to get certification; whom to contact in procurement offices; aircraft plant procedure with respect to specifications; deviations from specifications, who to see and how to obtain deviation permission.

Among those called upon at various times were *A. J. Chaplo,* of Anachem Laboratories; *Leo Antimion,* Modern Plating Co.; *Stanley Rynkofs,* Liberty Plating Co.; *Don Bedwell,* Hall-Mack Co.; and *Morrie Schwartz, Stuart Krentel, Richard Wooley, Earl Coffin, Dick Richardson.*

Guests introduced during the business session which preceded the educational program included *F. N. Goss,* Erie, Pa.; *Mr. Chaplo; Gordon Munsh,* Kelite Products; *William Harrigan,* Lumidor, Inc.; *Jack Miller,* Oakite Products; *Ralph Alexander,* North American Aviation.

The need for a vigorous membership drive was stressed when a report on membership disclosed that membership had dropped from 311 to 200 during the past year.

Applications for membership were received from the following: *Harold B. Wannamaker,* Avalon Plating Co.; *William Crawford,* Kelite, Inc.; *E. R.*

Nicodemus, Hughes Aircraft Co.; *Joseph Bylinowski*, Progressive Plating Co.; and *William Harrisan*, Lumidor, Inc.

Richard Wooley reported briefly on the Supreme Society convention, to which *Earl Arnold* added some further comments.

Ed Wells reported that both *Mr.* and *Mrs. Clarence Thornton* (he's Pacific Coast manager for Chas. F. L'Hommedieu & Sons Co.) had been seriously ill during the early part of September. Mr. Wells reported that both had been hospitalized for more than a week. Mr. Wells said he was glad to announce that both had now passed the crisis and were on the road to recovery.

The reports of treasurer *Peter V. Rodgers*, Secretary *Stuart Krentel*, and Picnic Committee Chairman *Dexter Halldin* were approved.

AMERICAN SOCIETY FOR TESTING MATERIALS

New Standards Accepted at Annual Meeting

At the annual meeting of the ASTM held recently at Atlantic City, the Committee B-8 on Electrodeposited Metallic Coatings accepted as Standard the folowing ASTM specifications:

B142-45—*Spec. for Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys.*

B242-49—*Recommended Practice for the Preparation of High Carbon Steel for Electroplating.*

The folowing ASTM specifications were adopted as Tentative Standards:

Recommended Practice for the Preparation of Zinc-Base Die-Castings for Electroplating.

Recommended Practice for the Preparation and Electroplating of Aluminum Alloys.

Recommended Practice for the Preparation and Plating of Stainless Steel.

Revisions were made to the following Standard Specifications:

Spec. for Electrodeposited Coatings on Steel A164-49T.

Spec. for Electrodeposited Coatings of Cadmium on Steel A165-49T.

A number of reports pertaining to the Metal Cleaning field were also accepted for publication as information only (not made official specifications). These included:

Proposed Methods of Test for Surface and Interfacial Tension of Solutions of Surface-Active Agents.

Proposed Method of Test for Total Immersion Corrosion Test for Soak Tank Metal Cleaners.

Proposed Method of Test for Rinsing Properties of Metal Cleaners.

Proposed method of test for Buffering Action of Metal Cleaners.